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ANNUAL SUMMARY, 1893.

The present annual summary completes the discussion of the meteorology of India for the year 1893.

It should be noted that in the monthly reviews it is attempted to present the facts and data from two different points of view. Meteorological data in India are chiefly utilised for the following purposes:—

1st, in the discussion of the prevalence and spread of diseases, more especially of cholera and other diseases of an epidemic character;

2nd, in connection with agricultural questions, more especially the progress and character of the crops as determined by the weather conditions of the period.

India has hence been divided into two groups of divisions from what may be termed the medical and agricultural standpoints. For medical statistics India is arranged into the following provinces, which are believed to be fairly homogeneous so far as the conditions of the prevalence of the more common diseases are concerned:—

- (1) Burma Coast and Bay Islands.
- (2) Burma Inland.
- (3) Assam.
- (4) Bengal and Orissa.
- (5) Gangetic Plain and Chota Nagpur.
- (6) Upper Sub-Himalayas, including the sub-montane districts of the North-Western Provinces and the Punjab, and the North and Central Punjab.
- (7) Indus Valley and North-West Rajputana.
- (8) South-East Rajputana, Central India and Gujarat.
- (9) Deccan.
- (10) West Coast.
- (11) South India.

The data for each of these divisions are given in Table I in large figures, and the portion of each monthly review entitled "Summary of the chief features of the weather in India during the month" is intended to give a sketch of the broader and more important features of the weather in India for the use of all those who study the relations between disease and weather in India.

According to the second method of arrangement into meteorological divisions or areas from the agricultural standpoint, there are 52 divisions, each of which is fairly homogeneous so far as the distribution of rainfall and the general character of the crops and the conditions of their

growth are concerned. The following gives the divisions arranged under the respective meteorological and political areas or provinces to which they belong:—

Political division or province.	Meteorological division.	Meteorological province.
BURMA	Tenasserim	Burma Coast and Bay Islands.
	Lower Burma	
	Arakan	Burma Inland.
	Central Burma	
	Upper Burma	
ASSAM	Assam (Surma)	Assam.
	" (Brahmaputra)	
BENGAL	East Bengal	Bengal and Orissa.
	Deltaic Bengal	
	Central Bengal	
	North Bengal	
	Orissa	
NORTH-WESTERN PROVINCES AND OUDH.	Chota Nagpur	Gangetic Plain and Chota Nagpur.
	Bihar, South	
	" North	
	North-Western Provinces, East	
	Oudh, South	
PUNJAB	" North	Upper Sub-Himalayas.
	North-Western Provinces Himalayas	
	North-West Provinces, Sub-montane	
	Punjab, Central	
	" Sub-montane	
RAJPUTANA	" North	Indus Valley and North-West Rajputana.
	Punjab West	
	Sind and Cutch	
CENTRAL INDIA	Rajputana, West	
	" East	
BOMBAY	Kathiawar	
	Central India	
	Gujarat	
NORTH-WESTERN PROVINCES.	North-Western Provinces, West	
BOMBAY	Bombay Deccan	Deccan.
	Khandesh	
BERAR	Berar	

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TABLE I.—Geographical Summary of the temperature data of Table II in the 1893 monthly reviews.

METEOROLOGICAL PROVINCE.	Number of Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
		°	°	°	°	°	°	°	°	°	°	°	°	°
North-West Himalaya	6—7	—5.8	—7.6	—5.7	—0.4	+0.3	—1.7	—1.3	0	—1.0	+0.2	—0.8	+0.6	—1.9
Sikkim Himalaya and Nepal.	2—3	—2.6	—3.7	—4.8	—0.4	+0.4	—1.6	—1.6	—0.8	—1.7	—0.7	—1.0	—1.8	—1.7
Punjab Plains . . .	4	—1.8	—5.7	—3.1	+2.1	+1.4	—0.7	—1.9	+1.1	—0.3	+0.7	+0.5	+2.4	—0.4
Gangetic Plain . . .	9	—1.8	—6.1	—4.7	—0.8	—2.0	—3.9	—2.2	+0.1	—1.8	—0.6	—0.7	+0.5	—2.0
Western Rajputana . .	3	—1.4	—6.2	—1.6	+1.8	+0.6	—1.5	—1.8	+0.7	—0.6	—0.7	+0.2	+1.8	—0.7
Eastern Rajputana and Central India.	4	—2.1	—5.4	—4.0	+1.0	—1.7	—3.5	—2.0	+0.8	—2.3	—1.2	—0.1	+0.5	—1.7
Nerbudda Valley . . .	3	—2.5	—5.0	—4.9	—0.9	—2.6	—3.7	+0.5	—0.5	—1.4	—0.9	+2.4	—0.6	—1.7
Chota Nagpur . . .	1	—2.7	—6.9	—5.6	—1.3	—4.8	—4.3	—1.2	+0.4	—1.4	—0.6	—0.4	+0.1	—2.4
Lower Bengal . . .	5	—1.7	—5.8	—5.4	—2.1	—3.2	—2.1	—0.7	+0.2	—0.9	0	0	—0.1	—1.8
Assam and Cachar . .	3	—1.5	—2.7	—3.1	—1.6	+1.7	—0.8	—1.8	—0.6	+0.1	+0.2	—0.1	—1.7	—1.0
Orissa . . .	2	—2.1	—2.5	—4.3	—1.2	—2.9	—2.0	+0.3	+0.4	—0.4	+0.3	+0.7	+0.1	—1.1
Central Provinces South and Berar.	5—6	—2.7	—4.7	—6.7	—0.6	—2.1	—2.6	+1.0	—0.8	—1.3	—0.6	+1.5	—0.4	—1.7
Konkan . . .	3	—1.4	—2.4	—1.7	+0.3	—1.0	—0.5	—0.1	—0.1	—0.1	—0.7	+1.1	+0.1	—0.5
Malabar Coast . . .	1	+1.1	+0.6	—0.3	—0.7	—1.6	—0.1	—0.7	+0.7	+0.1	—0.1	+0.1	+0.1	—0.1
Deccan, Hyderabad and Mysore.	5—6	—0.5	—0.7	—3.0	—1.4	—2.2	—1.4	+0.2	—1.2	—1.0	—1.3	+0.4	—1.4	—1.1
East Coast and Carnatic.	4	+0.6	+1.4	—0.3	—0.9	—0.6	—1.2	—0.9	+0.5	+0.5	+0.5	—0.5	—0.4	—0.1
Arakan and Pegu . . .	5	—2.3	—1.1	—2.1	—1.1	—2.2	—0.1	+0.1	+0.3	—0.2	—0.4	+0.2	—0.9	—0.8
Bay Islands . . .	1	—0.2	+0.2	+1.1	—0.8	—1.0	—0.5	—0.1	—0.4	+0.3	—1.2	+0.5	+3.4	+0.1
Extra Tropical India .	40—42	—2.6	—5.7	—4.4	—0.3	—0.9	—2.4	—1.5	+0.2	—1.2	—0.3	—0.1	+0.3	—1.6
Tropical India . . .	27—28	—1.3	—1.6	—3.0	—0.8	—1.8	—1.2	+0.1	—0.2	—0.4	—0.5	+0.5	—0.5	—0.9
Whole India . . .	67—70	—2.1	—4.1	—3.8	—0.5	—1.3	—2.0	—0.9	0	—0.9	—0.4	+0.1	0	—1.3

TABLE II(a).—Variation of the mean monthly maximum temperature from the normal in 1893 in the eleven Meteorological Provinces of India.

METEOROLOGICAL PROVINCE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Burma Coast and Bay Islands .	—1.0	+0.7	—1.2	—0.9	—4.4	+1.1	+0.5	+0.7	—1.0	—1.5	—0.5	—2.7	—1.0
Burma Inland . . .	—1.1	—0.2	—3.0	—2.2	—6.4	—0.3	+0.3	+0.4	—0.9	—3.0	—1.4	—2.9	—1.7
Assam . . .	—2.8	—4.4	—3.8	—2.3	+1.8	—1.3	—3.1	—1.9	—0.4	—0.5	—0.9	—1.5	—1.8
Bengal and Orissa . . .	—2.4	—7.3	—6.9	—3.2	—4.3	—3.4	—0.8	+0.5	—1.0	—0.7	—0.6	—0.1	—2.5
Gangetic Plain and Chota Nagpur.	—2.4	—8.9	—7.2	—2.5	—3.9	—5.1	—2.1	+0.4	—2.5	—1.5	—1.6	—0.1	—3.2
Upper Sub-Himalayas . . .	—6.2	—10.6	—8.0	—2.9	—3.4	—6.5	—5.0	+1.3	—3.5	—1.9	—2.1	—0.1	—4.1
Indus Valley and North-West Rajputana.	—4.1	—9.3	—3.4	+2.0	—0.7	—0.8	—3.5	+2.1	—0.9	—0.3	—1.0	+2.0	—1.5
East Rajputana, Central India and Gujarat.	—3.7	—8.2	—5.4	+0.9	—2.4	—4.1	—2.5	+2.1	—2.5	—1.3	—2.8	+0.9	—2.5
Deccan . . .	—3.1	—5.6	—8.5	—1.7	—2.9	—4.8	+1.2	—0.8	—1.8	—0.9	—0.9	+0.2	—2.5
West Coast . . .	—1.2	—2.0	—1.1	+0.2	—1.7	—0.7	—0.3	+0.6	+0.1	—0.6	+0.8	+1.0	—0.4
South India . . .	+0.5	+0.2	—2.9	—0.8	—1.2	—1.7	—1.2	—0.6	—0.7	—0.5	—1.4	—0.3	—0.9

TABLE II (b).—Variation of the mean monthly minimum temperature from the normal in 1893 in the eleven Meteorological Provinces of India.

METEOROLOGICAL PROVINCE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Burma Coast and Bay Islands .	—1.8	0	—0.5	—0.5	—0.6	+0.6	+0.4	+0.2	—0.3	—0.5	—1.2	—4.0	—0.7
Burma Inland . . .	—2.8	+1.1	+1.4	—1.8	—0.5	+0.3	+0.2	+0.2	—0.2	—1.0	—1.0	—5.8	—0.8
Assam . . .	—0.6	—0.7	—2.6	—1.0	+1.5	—0.7	—1.2	0	—0.6	—0.3	+0.8	—3.3	—0.7
Bengal and Orissa . . .	—1.2	—2.1	—3.7	—0.8	—1.0	—0.9	—0.1	+0.7	—0.3	+0.4	+1.2	+0.1	—0.7
Gangetic Plain and Chota Nagpur.	0	—2.6	—3.8	—0.7	—0.6	—2.3	—1.0	0	—1.2	+0.4	+3.0	+1.1	—0.6
Upper Sub-Himalayas . . .	+0.3	—2.4	—3.8	—0.6	+0.6	—2.3	—1.6	—0.5	0	—0.5	+1.0	+2.4	—0.7
Indus Valley and North-West Rajputana.	+0.7	—3.3	—2.4	+1.3	+1.2	—0.1	—1.3	—0.4	+0.8	—1.1	+0.8	+2.5	+0.1
East Rajputana, Central India and Gujarat.	—1.0	—3.4	—2.7	+1.1	—0.1	—1.5	—1.4	+0.2	—0.4	—2.8	+4.2	+2.1	—0.5
Deccan . . .	—0.6	—2.0	—3.6	—1.1	—0.9	—1.6	+0.1	—0.4	—0.5	—1.4	+4.6	+0.5	—0.6
West Coast . . .	—0.6	—0.8	—1.4	+0.2	—0.5	0	+0.1	+0.6	+0.3	—0.7	+1.6	—0.5	—0.1
South India . . .	+0.5	+2.7	+0.3	—1.6	—0.9	—0.8	—0.4	—0.3	—0.4	0	+1.0	—1.4	0

TABLE II (c).—*Variation of the mean monthly temperature from the normal in 1893 in the eleven Meteorological Provinces of India.*

METEOROLOGICAL PROVINCE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Burma Coast and Bay Islands .	-1.4	+0.3	-0.9	-0.7	-2.6	+0.9	+0.4	+0.5	-0.6	-1.0	-0.9	-3.4	-0.8
Burma Inland	-2.0	+0.5	-0.8	-2.0	-3.5	0	+0.3	+0.3	-0.6	-2.0	-1.2	-4.4	-1.3
Assam	-1.7	-2.6	-3.2	-1.7	+1.7	-1.0	-2.2	-1.0	-0.5	-0.4	0	-2.4	-1.3
Bengal and Orissa	-1.9	-4.8	-5.3	-2.0	-2.7	-2.2	-0.5	+0.6	-0.7	-0.1	+0.3	0	-1.6
Gangetic Plain and Chota Nagpur .	-1.3	-5.8	-5.6	-1.6	-2.3	-3.7	-1.6	+0.2	-1.8	-0.6	+0.7	+0.5	-1.9
Upper Sub-Himalayas	-3.0	-6.5	-5.9	-1.8	-1.4	-4.4	-3.3	+0.4	-1.8	-1.2	-0.6	+1.2	-2.4
Indus Valley and North-West Rajputana .	-1.5	-6.3	-2.8	+1.7	+0.3	-0.5	-2.4	+0.9	0	-0.8	-0.1	+2.3	-0.7
East Rajputana, Central India and Gujarat .	-2.3	-5.9	-4.0	+0.9	-1.3	-2.8	-2.0	+1.2	-1.5	-2.1	+0.7	+1.5	-1.5
Deccan	-1.9	-3.8	-6.1	-1.4	-2.0	-3.2	+0.6	-0.7	-1.2	-1.2	+1.9	+0.4	-1.6
West Coast	-0.9	-1.5	-1.3	+0.2	-1.1	-0.4	-0.1	+0.6	+0.2	-0.7	+1.2	+0.2	-0.3
South India	+0.5	+1.5	-1.2	-1.1	-1.2	-1.3	-0.8	-0.5	-0.6	-0.3	-0.2	-0.9	-0.5

TABLE III.—*Variation of the mean monthly and annual temperature from the normal in 1893 in the 52 Meteorological Districts or Divisions of India.*

PROVINCE.	DIVISION.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean variation of year.
BURMA	Tenasserim	-1.7	+0.5	0	+0.6	-3.1	+1.7	+0.5	+1.1	-0.6	-1.0	-0.9	-4.1	-0.6
	Lower Burma	-1.2	+0.2	+0.0	-1.2	-2.4	+0.6	+0.5	+0.5	-0.4	-0.9	-0.8	-3.3	-0.8
	Central do.	-2.0	+0.5	-0.8	-2.0	-3.5	0	+0.3	+0.3	-0.6	-2.0	-1.2	-4.4	-1.3
	Arakan	-2.6	-1.0	-2.3	-2.0	-2.1	-0.6	+0.1	+0.1	-1.3	-1.5	-0.9	-2.3	-1.4
BENGAL AND ASSAM.	Eastern Bengal	-1.9	-3.8	-4.0	-2.2	-1.4	-1.1	-0.6	+0.9	-0.3	-0.7	+0.3	-0.3	-1.3
	Assam (Surma)	-0.9	-2.8	-2.9	-0.7	+2.0	-0.5	-2.2	-0.7	+0.8	-0.2	+0.9	-1.0	-0.7
	Do. (Brahmaputra)	-2.2	-2.6	-3.4	-1.6	+1.5	-1.3	-2.2	-1.1	-1.2	-0.5	-0.5	-3.2	-1.5
	Deltaic Bengal	-1.9	-5.6	-2.2	-1.9	-2.8	-2.2	-0.6	+0.5	-0.5	+0.1	0	-0.3	-1.5
	Central do.	-1.5	-5.9	-6.3	-2.6	-3.1	-2.4	-0.8	+0.4	-1.1	-0.2	+0.5	+0.3	-1.9
	Orissa	-2.3	-3.4	-5.4	-2.1	-3.3	-2.7	+0.1	+0.4	-0.8	-0.1	+0.7	+0.6	-1.5
	Chota Nagpur	-2.0	-6.6	-7.4	-2.1	-4.1	-4.8	-0.6	+0.3	-1.4	-1.1	+1.5	+0.9	-2.3
	Bihar (South)	-0.6	-6.1	-6.1	-2.1	-2.5	-2.7	-1.3	+0.5	-1.9	-0.3	+1.0	+1.1	-1.8
	Do. (North)	-1.3	-4.9	-4.4	-0.9	-0.8	-0.7	-1.6	+0.4	-1.3	+0.4	+0.8	-0.2	-1.2
NORTH-WESTERN PROVINCES AND OUDH.	North-Western Provinces (East).	-1.2	-5.9	-5.9	-1.6	-2.4	-5.3	-2.0	0	-2.1	-1.0	+0.3	+0.5	-2.2
	Oudh (South)	-1.6	-6.2	-5.1	-1.5	-2.9	-6.3	-2.3	-0.1	-2.2	-1.2	+0.6	+0.2	-2.4
	North-Western Provinces (West).	-1.6	-6.2	-5.4	+1.1	-1.9	-3.8	-2.0	+2.2	-1.5	-1.8	+0.1	+1.5	-1.6
	North-Western Provinces (Submontane).	-2.6	-6.5	-6.2	-2.2	-2.1	-4.7	-2.1	0	-1.8	-0.9	-0.6	+1.2	-2.4
PUNJAB	Punjab (South)	-3.1	-8.0	-5.1	-0.9	-0.9	-3.1	-3.4	+2.2	-1.4	-0.9	-0.7	+1.4	-2.0
	Do. (Central)	-3.0	-6.0	-4.9	-0.8	+1.4	-2.1	-3.0	+2.0	-0.9	-0.1	+1.1	+2.5	-1.2
	Do. (Submontane)	-3.2	-6.9	-6.3	-1.2	-1.9	-4.0	-3.4	+0.4	-2.9	-2.1	-0.7	+0.9	-2.6
	Do. (Hill Districts)	-7.3	-8.7	-7.6	-1.5	-2.2	-4.8	-3.8	-0.6	-2.8	-1.0	-1.1	+1.5	-3.3
	Do. (North-West)	-2.9	-6.3	-4.9	-0.3	+0.4	-3.7	-5.1	-0.7	-0.9	-1.5	-0.5	+1.2	-2.1
	Do. (West)	-2.0	-6.5	-3.5	+2.1	+1.0	+1.1	-1.8	+0.7	+0.1	-0.1	+0.1	+1.7	-0.6
BOMBAY AND MALABAR COAST DISTRICTS (MADRAS).	Malabar	+0.3	0	-0.5	-0.4	-1.8	+0.1	-0.8	+1.0	+0.5	-0.6	+1.0	-0.4	-0.1
	Madras (South Central)	-1.0	+2.0	-0.9	-1.9	-2.7	-1.3	-0.5	+0.4	+1.0	-0.1	-0.9	-1.2	-0.6
	Coorg	-0.1	?	-1.5	-0.6	-1.1	+1.3	+0.2	-0.2	-1.3	-0.6	+0.1	-1.5	?
	Mysore	+1.8	+3.0	-0.8	-1.4	-1.8	-0.9	-0.7	-0.2	-0.2	-0.5	+0.1	-1.5	-0.3
	Konkan	-1.9	-2.4	-1.6	+0.5	-0.7	-0.6	+0.3	+0.4	+0.1	-0.7	+1.4	+0.6	-0.4
	Bombay Deccan	-0.9	-1.8	-3.1	-1.3	-1.7	-2.1	+0.6	-1.0	-0.7	-1.3	+0.7	-0.9	-1.1
	Khandesh	-1.7	-3.8	-3.8	+0.8	-2.0	-2.7	+0.5	-0.2	-0.3	-0.8	+3.8	+1.5	-0.7
CENTRAL PROVINCES AND BERAR.	Berar	-2.3	-4.3	-7.3	-1.2	-1.7	-3.1	+2.5	-1.7	-1.5	-1.1	+2.3	+1.1	-1.5
	Central Provinces (West)	-2.6	-5.4	-6.3	-1.3	-1.9	-3.4	+0.7	-0.9	-1.5	-1.4	+2.6	+0.6	-1.7
	Do. (Central)	-2.5	-5.5	-7.0	-1.5	-2.1	-4.0	-0.2	-0.1	-1.4	-1.9	+1.8	+0.4	-2.0
	Do. (East)	-2.5	-5.2	-6.4	-2.3	-2.7	-3.9	+0.4	-0.4	-1.2	-0.4	+2.2	+1.1	-1.8

TABLE III.—Variation of the mean monthly and annual temperature from the normal in 1893 in the 52 Meteorological Districts of India—concluded.

PROVINCE.	DIVISION.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Mean variation of year.
		°	°	°	°	°	°	°	°	°	°	°	°	
BOMBAY (NORTH)	Gujarat	-1.5	-3.4	-1.6	-0.1	+0.1	-2.1	-0.3	+0.7	-0.7	-1.5	+2.4	+2.1	-0.5
	Kathiawar	-3.1	-5.5	-2.4	+1.1	-1.1	-2.5	-1.5	+0.6	-0.4	-1.4	+0.5	+3.4	-1.0
	Sind and Cutch	-0.5	-6.0	-1.8	+2.0	0	-0.7	-1.9	+1.0	+0.3	-1.3	-0.3	+2.6	-0.6
RAJPUTANA AND CENTRAL INDIA	Central India (East)	-2.3	-5.5	-5.1	-0.6	-2.4	-5.3	-0.9	+0.6	-1.6	-2.0	+0.8	+0.4	-2.0
	Rajputana (East)	-2.9	-5.9	-3.6	+1.2	-1.0	-2.2	-2.4	+1.2	-1.7	-2.2	+0.7	+1.4	-1.5
	India (West)	?	?	?	?	-3.2	-2.0	-4.0	+1.8	-1.1	-0.9	-0.4	+2.9	?
MADRAS	Rajputana (West)													
	East Coast (North)	-0.3	+1.2	-2.1	-1.1	-0.7	-1.0	+1.5	-0.8	-1.8	0	+0.2	-0.2	-0.4
	Hyderabad (South)	-0.3	+0.3	-6.1	-1.5	-1.4	-2.2	+0.9	-1.1	-1.6	-1.1	+0.6	-0.9	-1.2
	Madras (Central)	+0.2	+1.1	-2.5	-2.2	-2.3	-2.1	-1.5	-1.5	-1.2	-0.9	+0.1	-1.4	-1.2
	East Coast (Central)	-1.4	+1.4	-1.3	-0.1	+0.2	-1.9	-0.9	-1.0	-2.4	-1.5	-0.5	-0.4	-0.8
	East Coast (South)	-0.7	+1.7	+0.3	-0.8	+0.4	-1.4	?	+0.8	+1.0	+0.8	-0.3	-0.3	?
	Madras South	-0.4	+1.1	-1.1	-1.2	-0.3	-1.5	-3.1	-0.6	+0.3	-0.8	-1.5	-0.8	-0.8

In the following discussion of the meteorology of India during the year 1893, the year is divided into four seasons according to the following arrangement:—

1st—The cold weather period, including the months of January and February.

2nd—The hot weather period, including the months of March, April and May.

3rd—The period of the south-west monsoon rains proper, including the months of June, July, August and September.

4th—The period of the retreating south-west monsoon, including the months of October, November and December.

The following gives a *résumé* of the chief features of the temperature conditions during the year:—

I. The Cold Weather Period.—The weather was unusually disturbed during this period in Northern India. A succession of cold weather storms followed at short intervals, during which snow fell in much larger amounts than usual. A noteworthy feature in connection with this precipitation was that snow fell to much lower levels in the Afghan and Western Himalayan mountain areas than has occurred for many years.

In January four storms advanced across Northern India, each of which gave more or less general rain in Northern and Central India and unusually heavy snow in the Himalayas. In the month of February there were also four disturbances. The first three were ordinary cold weather storms, and advanced from Baluchistan across Northern India. The fourth disturbance commenced as a cold weather storm, but its disappearance was followed by unsettled showery weather for some days over the greater part of India.

Each of the storms was preceded by a warm wave and followed by a cool wave. These waves advanced across

Northern India, and in consequence of the rapid succession of storms the temperature changes were unusually large and rapid. The storms gave abnormally heavy snowfall in Baluchistan and the Western and Central Himalayas. The snowfall in Afghanistan was also heavier than usual, but the chief feature in that area was the intense cold, the winter in this respect being the most severe that has been experienced during the past fifty years. The unusual severity of the cold was also the chief feature of the winter in the Upper Sutlej Valley and in Ladakh and probably over the greater part of the Western Himalayan mountain area. The following gives a summary of the chief features of the temperature conditions of the period:—

1st—The mean maximum or day temperature was considerably below the normal during this period in Northern and Central India, as is shewn by the following data:—

POLITICAL DIVISION.	VARIATION OF MEAN MAXIMUM TEMPERATURE FROM NORMAL.		
	January 1893.	February 1893.	Average variation of period.
Punjab	-6.4	-10.4	-8.4
North-Western Provinces	-4.3	-9.8	-7.1
Rajputana	-4.1	-9.1	-6.6
Central India	-3.8	-7.9	-5.9
Bihar and Chota Nagpur	-1.8	-8.1	-5.0
Bengal and Orissa	-2.4	-7.3	-4.9
Assam	-2.8	-4.4	-3.6

Hence the day temperature was very considerably in defect. The reduction of temperature was greatest in the Punjab and North Western Provinces and decreased in amount eastwards and southwards. It was also considerably greater in February than in January, a result

of the continuance of the disturbed conditions in Northern India and of the increasing snow accumulation in the adjacent mountain districts.

2nd—The mean minimum or night temperature was below the normal in the same areas but to a less extent than the maximum temperature.

POLITICAL DIVISION.	VARIATION FROM NORMAL OF MEAN MINIMUM TEMPERATURE OF		
	January 1893.	February 1893.	Average variation of period.
	°	°	°
Punjab	+0.4	-3.0	-1.3
North-Western Provinces	+0.5	-2.7	-1.1
Rajputana	-1.8	-3.6	-2.7
Central India	-1.5	-3.3	-2.4
Bihar and Chota Nagpur	-0.5	-2.8	-1.7
Bengal and Orissa	-1.2	-2.1	-1.7
Assam	-0.6	-0.7	-0.7

3rd—The mean daily temperature was in considerable defect over the whole of Northern and Central India.

PROVINCE.	VARIATION FROM NORMAL OF MEAN DAILY TEMPERATURE OF		
	January 1893.	February 1893.	Average variation of period.
	°	°	°
Punjab	-3.0	-6.7	-4.9
North-Western Provinces	-2.0	-6.3	-4.2
Rajputana	-3.0	-6.4	-4.7
Central India	-2.7	-5.6	-4.2
Bihar and Chota Nagpur	-1.2	-5.5	-3.4
Bengal and Orissa	-1.8	-4.7	-3.3
Assam	-1.7	-2.6	-2.2

4th—Temperature was even more largely in defect at the hill stations in Northern India than it was at the neighbouring plain stations. The following gives variation data of eight representative hill stations for the period:—

HILL STATION.	VARIATION FROM NORMAL OF MEAN		
	Maximum temperature January and February 1893.	Minimum temperature January and February 1893.	Mean daily temperature January and February 1893.
	°	°	°
Quetta	-7.7	-5.8	-6.8
Murree	-8.9	-7.1	-8.0
Chakrata	-8.3	-5.5	-6.9
Mount Abu	-8.1	-5.5	-6.8
Darjeeling	-2.8	-3.1	-3.0
Pachmarhi	-4.8	-1.8	-3.3
Leh	-6.4	-3.1	-4.8
Kailang	-5.0	-5.2	-5.1

The season was one of exceptional coldness at many of the hill stations. The following gives the lowest temperature at several of these stations together with the lowest previously recorded for comparison:—

STATION.	Lowest temperature recorded in cold weather period, 1893.	Lowest temperature previously recorded.	Year.
	°	°	
Kailang	-9.8	-7.0	1887
Leh	-4.8	-17.0	1878
Gnatong	-5.5	3.1	1892
Kalat	3.0	-3.0	1891
Meshed	4.0	1.0	1891
Srinagar	4.1	23.1	1892
Murree	19.2	16.7	1886
Simla	19.2	19.7	1883

In the plains of Northern India the lowest minimum temperatures were recorded in the great majority of cases during two periods, *vis.*, the 27th and 28th of January and the 2nd and 3rd of February. These were not so low as were experienced in the corresponding period of the previous year.

The following gives the lowest night temperatures registered at representative stations in Northern India during the cold weather of 1893 and the lowest previously recorded for comparison:—

STATION.	Lowest minimum temperature recorded during cold weather, 1893.	Lowest previously recorded.	Year.
	°	°	
Peshawar	31.9	28.8	1878 & 1880.
Lahore	33.2	29.2	1889
Agra	39.1	36.3	1878
Sirsa	31.7	30.0	1878
Jeypore	36.7	34.8	1884
Jacobabad	34.5	29.0	1887
Allahabad	40.4	30.0	1878
Hazariabagh	40.2	37.5	1874

II. The Hot Weather Period.—The temperature conditions of the month of March were similar to those of the preceding month, and hot weather conditions did not set in until nearly the end of March. This was mainly due to the occurrence of a number of disturbances of the cold weather class and to frequent and heavy rainfall, more especially in Central India, the Central Provinces and North Deccan. The following is a brief statement of the chief temperature features of March:—

1st—Temperature was largely below the normal in the Central Provinces, Berar, the North Deccan and Central India, the deficiency

being very large in the day temperature.
The following gives data :—

DISTRICT.	VARIATION FROM NORMAL IN MARCH 1893 OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean daily temperature.
	°	°	°
Berar	-11.3	-3.2	-7.3
Central Provinces, West	-9.2	-3.4	-6.3
Ditto Central	-9.5	-4.5	-7.0
Ditto East	-10.2	-2.6	-6.4
Hyderabad	-9.4	-2.8	-6.1

2nd—Temperature was almost as largely in defect over the whole of Northern India as it was in the area of greatest deficiency of temperature for which data are given above. The deficiency was large in the day temperature and moderate in the night temperature.

DISTRICT.	VARIATION FROM NORMAL IN MARCH 1893 OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean daily temperature.
	°	°	°
Punjab	-6.4	-3.4	-4.9
North-Western Provinces	-7.6	-3.7	-5.7
Bihar	-6.8	-3.7	-5.3
Chota Nagpur	-8.2	-6.5	-7.4
Berhal	-5.7	-2.6	-4.2
Rajputana	-4.7	-2.5	-3.6
Sind	-2.4	-1.2	-1.8

3rd—The deficiency of temperature was even greater at the hill stations than in the plains, and was almost as marked in the night as in the day temperature. The following gives data for seven stations :—

STATION.	VARIATION FROM NORMAL IN MARCH 1893 OF		
	Mean maximum temperature.	Mean minimum temperature.	Mean daily temperature.
	°	°	°
Quetta	-2.9	-4.4	-3.7
Leh	-5.9	-4.2	-5.1
Murree	-5.8	-6.3	-6.1
Simla	-8.2	-5.9	-7.1
Chakrata	-8.7	-6.1	-7.4
Darjeeling	-5.3	-4.8	-5.1
Mount Abu	-6.1	-3.6	-4.9

4th—Temperature was in slight defect in Burma and Southern India by moderate amounts, except in the South Coromandel coast districts, and at Port Blair in the Andamans, where it was in slight excess.

The temperature conditions of April and May 1893 preceded a much stronger monsoon than usual, in fact one of the strongest of recent years as estimated by the rainfall or actual strength of the winds at the coast and interior stations. Temperature increased more rapidly than usual in the last week of March and first week of April, and afterwards increased at approximately its normal rate. The rise of temperature was very rapid in North-Western India during the first ten days of April, and from the 10th to the 15th April temperature was from 5° to 10° above the normal over the greater part of that area. This unusually rapid increase was, however, followed by a period of disturbed weather, which reduced temperature very considerably. Hence, as shown in page 529, the mean temperature of the month was below the normal over nearly the whole of India.

In the month of May, temperature increased rapidly during the first week. This was followed by disturbed weather (marked by series of dust storms and thunder storms) lasting from the 6th to the 14th. Temperature then increased until the 24th in North-Western India, when it was largely in excess.

The following table gives the highest actual maximum temperatures of the 24th recorded at 8 A.M. of the 25th at seven stations in North-Western India :—

STATION.	TEMPERATURE.		
	Maximum of the 24 hours preceding 8 A.M. of 25th.	Minimum of the 24 hours preceding 8 A.M. of 25th.	Mean.
	°	°	°
Sirsa	114.9	89.5	102.2
Khushab	114.1	88.1	101.1
Agra	113.5	85.9	99.7
Montgomery	112.9	85.0	99.0
Sialkot	112.3	89.7	101.0
Lahore	112.3	88.0	100.2
Jacobabad	109.3	84.6	97.0

The following gives the variation of the temperatures from the normal for five of these stations for which normal data are available :—

STATION.	VARIATION FROM NORMAL OF		
	Maximum temperature.	Minimum temperature.	Mean temperature.
	°	°	°
Sirsa	+8.8	+13.4	+11.1
Agra	+5.9	+3.9	+4.9
Sialkot	+8.9	+15.4	+12.2
Lahore	+8.8	+15.5	+12.2
Jacobabad	-1.6	+6.3	+2.4

A comparison of these figures with similar data for the corresponding period of previous years indicates that the temperature conditions in Upper India were not so marked as usually obtain immediately before or are coincident with

the first great burst of monsoon winds and rain, and the area of highest temperature and greatest excess of temperature was further north than usual, *viz.* in the Punjab, and not in Sind. This period of excessive temperature was coincident with the formation and advance of a severe cyclonic storm which crossed the West Bengal coast on the 26th and gave a deluge of rain to Orissa and South Bengal. The absolutely highest temperature recorded during the month and the year was 119°0 at Jacobabad on the 7th. The mean temperature of the month of May was generally below the normal, the deficiency being greatest in the areas influenced by the strong sea winds or the cyclonic storm of the month.

The following gives the chief features of the mean temperature conditions of the months of April and May:—

1st—Temperature was in moderate defect in North-Eastern India and Burma. The following gives data:—

DISTRICT.	VARIATION OF MEAN TEMPERATURE FROM NORMAL IN		
	April 1893.	May 1893.	Period, April and May.
	°	°	°
Burma	-1'2	-2'8	-2'0
Bengal	-2'2	-2'4	-2'3
Orissa	-2'1	-3'3	-2'7
Chota Nagpur	-2'1	-4'1	-3'1
Bihar	-1'5	-1'7	-1'6

The preceding data show that the deficiency was greater in May than in April. It was most marked in Orissa, Chota Nagpur and West Bengal.

2nd—Temperature was in slight defect in the Peninsula as is shown by the following data:—

	VARIATION OF MEAN TEMPERATURE FROM NORMAL IN		
	April 1893.	May 1893.	Period, April and May.
	°	°	°
Central Provinces	-1'7	-2'2	-2'0
Berar	-1'2	-1'7	-1'5
Bombay	-0'1	-1'6	-0'9
Madras	-1'2	-0'9	-1'1

3rd—Temperature was in slight defect in North-Western and Central India. The deficiency decreased northwards and westwards and was small in amount in the Punjab. Temperature was in slight to moderate excess in Sind

and Baluchistan. The following gives variation data for this area:—

	VARIATION OF MEAN TEMPERATURE FROM NORMAL IN		
	April 1893.	May 1893.	Period, April and May 1893.
	°	°	°
North-Western Provinces	-1'1	-2'3	-1'7
Central India	-0'6	-2'4	-1'5
Rajputana	+1'2	-2'1	-0'5
Sind	+2'0	0	+1'0
Punjab	-0'2	0	-0'1
Baluchistan (Quetta)	+1'7	+3'5	+2'6
Punjab Hill Stations	-1'5	-2'2	-1'9

III. The south-west monsoon period.—The south-west monsoon current in the Bay of Bengal was established somewhat earlier, whilst that in the Arabian Sea was slightly later than usual. The two currents extended abnormally quickly over the interior and prevailed with unusual steadiness over the whole of Northern India until nearly the end of September. The total rainfall of the period was in excess over the whole of Northern and Central India, the excess being most marked in the interior districts, more especially, Rajputana, the North-Western Provinces and the Punjab. More abundant and frequent rain than usual during the south-west monsoon period reduces both the day and night temperatures below the normal, the reduction being greater in the day than in the night temperature. The decrease of temperature is also larger in amount for similar (*i.e.*, equal percentage) variations in the rainfall in the drier districts of the interior, where the rainfall is more variable and irregular, than in the coast districts. The following tables giving variation data for the larger provinces show the abnormal temperature features of this period:—

DISTRICT.	VARIATION FROM NORMAL OF MEAN MAXIMUM TEMPERATURE IN				
	June 1893.	July 1893.	August 1893.	September 1893.	Period, June to September 1893.
	°	°	°	°	°
Burma	+0'6	+0'4	+0'7	-1'1	+0'2
Assam	-1'2	-3'3	-1'8	+0'1	-1'6
Bengal and Orissa	-3'3	-0'8	+0'4	-1'0	-1'2
Bihar and Chota Nagpur	-3'7	-1'5	+0'4	-2'0	-1'7
North-Western Provinces and Oudh.	-6'7	-2'7	+1'3	-2'8	-2'7
Punjab	-4'5	-5'5	+2'1	-3'3	-2'8
Rajputana	-2'6	-4'1	+2'3	-2'7	-1'8
Central India	-7'0	-0'9	+1'8	-2'3	-2'1
Central Provinces	-5'5	+0'8	-0'4	-2'0	-1'8
Bombay	-2'1	+0'5	-0'1	-0'3	-0'5
Madras	-2'2	-1'3	-0'7	-0'6	-1'2

DISTRICT.	VARIATION FROM NORMAL OF MEAN MINIMUM TEMPERATURE IN				
	June 1893.	July 1893.	August 1893.	September 1893.	Period June to September 1893.
Burma	+0.3	+0.3	+0.4	-0.3	+0.2
Assam	-0.6	-1.1	+0.1	-0.5	-0.5
Bengal and Orissa	-0.9	-0.1	+0.7	-0.3	-0.2
Bihar and Chota Nagpur	-1.8	-0.7	+0.3	-1.0	-0.8
North-Western Provinces and Oudh.	-3.3	-1.5	-0.3	-1.0	-1.5
Punjab	-0.2	-1.1	-0.3	+1.0	-0.2
Rajputana	-1.6	-2.3	+0.6	-0.1	-0.9
Central India	-3.6	-0.9	-0.6	-0.9	-1.5
Central Provinces	-2.0	-0.2	-0.4	-0.6	-0.8
Bombay	-0.5	-0.2	+0.2	+0.1	-0.1
Madras	-0.8	-0.4	-0.3	-0.4	-0.5

DISTRICT.	VARIATION FROM NORMAL OF MEAN DAILY TEMPERATURE IN					Variation of rainfall of period from normal.
	June 1893.	July 1893.	August 1893.	September 1893.	Period June to September 1893.	
Burma	+0.5	+0.4	+0.6	-0.7	+0.2	Inches. -8.39
Assam	-0.9	-2.2	-0.9	-0.2	-1.1	+8.03
Bengal and Orissa	-2.1	-0.5	+0.6	-0.7	-0.7	+6.02
Bihar and Chota Nagpur	-2.8	-1.1	+0.4	-1.5	-1.3	+7.43
North-Western Provinces and Oudh.	-5.0	-2.1	+0.5	-1.9	-2.1	+5.54
Punjab	-2.4	-3.3	+0.9	-1.2	-1.5	+5.17
Rajputana	-2.1	-3.2	+1.5	-1.4	-1.3	+5.03
Central India	-5.3	-0.9	+0.6	-1.6	-1.8	-0.95
Central Provinces	-3.8	+0.3	-0.4	-1.3	-1.3	+2.36
Bombay	-1.3	+0.2	+0.1	-0.1	-0.3	-5.04
Madras	-1.5	-0.9	-0.5	-0.5	-0.8	+3.07

A comparison of the last two columns in the third table giving mean temperature data, shows that the variations of the temperature were chiefly related to the distribution of rainfall, the deficiency depending upon the excess in the rainfall of the period and also upon the normal character of the rainfall in the area (*i.e.*, whether it is steady and large in amount as in the coast districts or occasional and very irregular as in the north-western districts of India). The chief features of the temperature conditions of the period may be summed up as follows:—

1st.—Large deficiency of the day temperature in June and July and moderate deficiency in September over nearly the whole of India. The defect was greatest in the North-Western Provinces and Central India in June and in the Punjab in July and September. It was in slight to moderate excess in August over the whole of India except Assam and the Peninsula.

2nd.—The mean minimum or night temperature was in moderate general defect in June and in slight defect in July and September. The deficiency was greatest in Central India and the North-Western Provinces in June and in Rajputana in July. The mean minimum temperature was practically normal in August.

On the mean of the whole period it was normal in Burma, in slight defect over the greater part of India, and in moderate defect (averaging $1\frac{1}{2}^{\circ}$) in the North-Western Provinces and Central India.

3rd.—The mean daily temperature was in slight to large defect in June and in moderate defect generally in July and September. It was normal or in slight excess in August. It was on the mean of the whole period normal in Burma and in defect over the whole of India. The deficiency averaged less than 1° in Madras, Bombay and Bengal and ranged between 1° and 2° in the interior districts of Northern and Central India and the Central Provinces. It was absolutely greatest in the North-Western Provinces ($-2^{\circ}1$) and Central India ($-1^{\circ}8$).

IV. The retreating south-west monsoon period.

—The temperature conditions of this period were characterized by a series of large and important variations from the normal determined chiefly by abnormal features in the air motion and the distribution of rainfall. The withdrawal of the monsoon currents from North-Western India in the last week of September was followed by a stronger set of the Bay current to Burma and North-Eastern India for a short period. The Bay current was diverted to the Peninsula about the middle of October and gave unusually heavy and frequent rain to the Peninsula until the end of November. The rainfall during the period was abundant over the whole area, and was abnormally excessive in the month of November over the north of the Peninsula, including Betar, the Central Provinces and Central India. During this period pressure had increased more rapidly than usual in Assam and Upper Burma, and was considerably in excess relatively to the districts to the south and south-west during the greater part of November and December. Hence abnormally strong and dry northerly winds prevailed during the month of December in Burma and extended over the east and south of the Bay, and the rainfall of the month of December in Madras was hence small in amount and confined to the South Coromandel coast districts and was chiefly due to intensified north-east monsoon winds and not to retreating south-west monsoon winds. The following gives a brief statement of the more important abnormal features of the temperature conditions of the period:—

1st.—Temperature was in marked defect in Burma and the Andamans. The defect was small in October, when it was chiefly due to increased rainfall. It was also small in amount in November and was large in December. As might be expected from the determining conditions, the deficiency was larger

in the night than in the day temperature. A fuller statement of the conditions of this cool period will be found in page 493 of the December Review. The coolest day of this period in Burma was the 10th of December, when the mean maximum temperature of the 24 hours preceding 8 A. M. of that day was 6°20 below the normal and the mean minimum 9°20 below it.

The following table gives variation data for Burma and Port Blair in illustration of the preceding remarks:—

BURMA.

VARIAION FROM NORMAL OF	OCTOBER 1893.	NOVEMBER 1893.	DECEMBER 1893.
	°	°	°
Maximum temperature	-1°9	-0°8	-2°6
Minimum "	-0°7	-1°1	-4°4
Mean "	-1°3	-1°0	-3°5

PORT BLAIR.

VARIAION FROM NORMAL OF	OCTOBER 1893.	NOVEMBER 1893.	DECEMBER 1893.
	°	°	°
Maximum temperature	-2°0	-0°7	-0°5
Minimum "	-1°4	+1°2	-0°1
Mean "	-1°7	+0°3	-0°3

2nd.—Temperature was in large excess during the greater part of this period in the Central Provinces, Berar, the North Deccan and Central India. The increased temperature accompanied excessive humidity and increased cloud amount due to the abnormal extension of humid winds from the Bay into those areas throughout the month of November. The following gives data in illustration:—

CENTRAL PROVINCES.

VARIAION FROM NORMAL OF	OCTOBER 1893.	NOVEMBER 1893.	DECEMBER 1893.	Period October to December.
	°	°	°	°
Maximum temperature	-1°0	-0°6	+0°5	-0°4
Minimum "	-1°4	+4°9	+0°9	+1°5
Mean "	-1°2	+2°2	+0°7	+0°6

BERAR.

VARIAION FROM NORMAL OF	OCTOBER. 1893.	NOVEMBER. 1893.	DECEMBER. 1893.	Period October to December.
	°	°	°	°
Maximum temperature	-1°1	-1°6	+0°5	-0°7
Minimum "	-1°0	+6°1	+1°6	+2°2
Mean "	-1°1	+2°3	+1°1	+0°8

CENTRAL INDIA.

VARIAION FROM NORMAL OF	OCTOBER. 1893.	NOVEMBER. 1893.	DECEMBER. 1893.	Period October to December. 1893.
	°	°	°	°
Maximum temperature	-3°1	-3°5	-0°6	-2°4
Minimum "	-0°9	+5°1	+1°4	+1°9
Mean "	-2°0	+0°8	+0°4	-0°3

The abnormal temperature conditions in the Central Provinces, Berar and Central India were very marked in the month of November and more especially from the 17th to the end of the month. The following variation data for six stations in that area for the 28th illustrate more fully than the preceding average data the remarkable temperature conditions of this cloudy damp period in the Central Provinces and Central India:—

STATION.	VARIAION FROM NORMAL OF		Humidity, 8 A.M.	Cloud, 8 A.M.
	Maximum temperature of 24 hours preceding 8 A.M. of 28th.	Minimum temperature of 24 hours preceding 8 A.M. of 28th.		
Akola	+5°9	+12°5	80	I
Khandwa	+7°8	+15°8	74	0
Hoshangabad	+5°0	+13°1	90	0
Seoni	+2°2	+11°9	87	I
Jubbulpore	+6°5	+12°4	82	0
Indore	+5°8	+11°2	90	0

3rd.—The variations of the temperature conditions from the normal over the remainder of India were not large in amount and were determined chiefly by the character and distribution of the rainfall.

The following table gives comparative data for the larger Provinces:—

PROVINCE.	VARIAION FROM NORMAL OF MEAN DAILY TEMPERATURE IN				Variation of rainfall.
	OCTOBER 1893.	NOVEMBER 1893.	DECEMBER 1893.	Period October to December.	
	°	°	°	°	Inches.
Burma	-1°2	-0°9	-3°5	-1°9	-0°45
Bengal	-0°2	+0°4	-0°2	0	+0°20
North-Western Provinces	-1°2	-0°1	+0°9	-0°1	+2°13
Punjab	-1°0	-0°3	+1°5	+0°1	-0°25
Rajputana	-1°8	+0°1	+2°0	+0°1	+1°32
Central India	-2°7	+1°2	+0°5	-0°3	+0°16
Central Provinces	-1°3	+2°2	+0°7	+0°5	+2°00
Bombay	-1°0	+1°3	+0°2	+0°2	-0°70
Madras	-0°3	-0°2	-0°9	-0°5	+3°52

It may be noted that the abnormally low temperature conditions during December 1893 in Burma were very similar in their character and period to the conditions of a cold period in the previous year, which lasted during the whole of December and were most prominent during the latter half of the month. The following gives a compar-

tive statement of the lowest night temperatures observed in that area during each of these two periods :—

STATION.	LOWEST MINIMUM TEMPERATURE RECORDED IN °	
	December 1893.	December 1892.
Bassein	55.0	55.0
Rangoon	57.7	56.7
Moulmein	58.4	56.4
Toungoo	51.1	51.1
Thayetmyo	46.2	47.8
Mandalay	51.0	45.1
Bhamo	39.4	44.9

The year.—The following table gives the variations of the mean temperature of Extra Tropical and Tropical India from the normal month by month during the year :—

MONTH.	VARIATION FROM NORMAL OF MEAN DAILY TEMPERATURE IN		
	Extra Tropical India.	Tropical India.	Whole India.
January	-2.6	-1.3	-2.1
February	-5.7	-1.6	-4.1
March	-4.4	-3.0	-3.8
April	-0.3	-0.8	-0.5
May	-0.9	-1.8	-1.3
June	-2.4	-1.2	-2.0
July	-1.5	+0.1	-0.9
August	+0.2	-0.2	0
September	-1.2	-0.4	-0.9
October	-0.3	-0.5	-0.4
November	-0.1	+0.5	+0.1
December	+0.3	-0.5	0
Whole year	-1.6	-0.9	-1.3

The mean monthly temperature was hence above the normal in only one month of the year, *viz.*, November, and the excess in that month was only 0° 1. Temperature was largely below the normal in the months of January, February and March, the deficiency being greatest in February in Extra Tropical India, when the mean temperature of the month was 5° 7 below the normal, and in Tropical India in March, when it averaged 3° in defect in that area. The deficiency was small and less than 1° in amount during the remainder of the year except in the months of May and June. In the former month it was in slight defect in Extra Tropical India and in moderate defect in Tropical India, due to the unusually early temporary advances of humid winds to Burma and Southern India. It was in moderate defect in both areas in June. The deficiency was greatest in Extra Tropical India and averaged 2° 4. It was due to the unusually rapid extension of the south-west monsoon winds and rainfall over the whole of North-Western and Central India.

The following are the larger and broader features of the temperature conditions of the year in India which require to be borne in mind in the discussion of the relations

between the variations of the more important elements of meteorological observation :—

1st.—The year 1893 was the coolest that has been experienced during the past 20 years in India. The coolest year previous to 1893 in the period 1875—93 was 1884 when the mean temperature of the whole of India in the year was 0° 61 below the normal. The deficiency in 1893 averaged 1° 33 or more than double that of 1884.

2nd.—The cold weather was remarkable for its low temperature in the Himalayan and Afghan hill districts as well as over the plains of Northern and Central India. The cold weather really lasted until the end of March or a month later than usual. A noteworthy feature of the period was that the deficiency in the months of February and March was remarkably uniform in amount over the whole of Northern and Central India and hence represented a general reduction of temperature in Extra Tropical India due to abnormal conditions common to the whole of India.

3rd.—Temperature was in moderate defect in the month of May immediately preceding the advent of the monsoon (the strongest of recent years as measured by the rainfall as well as the strength of the winds), over the whole of India except in Sind and Baluchistan where it was in slight excess. The excess in the latter area averaged 1° only, whilst the deficiency in the remainder of India averaged 1½°.

4th.—Temperature was in moderate defect over the whole of North-Western and Central India during the months of June, July and September and was in very slight excess in August. So far as can be judged from the temperature data of Port Blair and other insular and coast stations, the temperature conditions of the coast districts and neighbouring seas were practically normal throughout the whole period.

5th.—The variations of the mean temperature from the normal were similar in character although differing in amount in eight months out of the twelve for Tropical and Extra Tropical India. In the case of the remaining four months the variations were very small in amount. As there is a marked tendency for the variations to be of opposite signs in those

two large divisions of the Indian area, the similarity of variations is a further evidence that the abnormal temperature con-

ditions of the year were determined by larger and more general causes and actions than usually operate in the Indian area.

The following table gives the progressive variation of the mean annual temperature of the past 19 years :—

YEAR.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.
Number of stations	72	72	74	74	70	106	110	113	122	122	118	122	126	127	81	85	72	74	68
Mean anomaly	-0.29	-0.08	+0.17	+0.62	-0.13	+0.13	-0.01	-0.11	-0.48	-0.61	-0.29	+0.08	-0.23	+0.36	+0.86	+0.13	-0.03	+0.66	-1.33
Progressive variation.	...	+0.21	+0.25	+0.45	-0.75	+0.26	-0.14	-0.10	-0.37	-0.13	+0.32	+0.37	-0.31	+0.59	+0.50	-0.73	-0.16	+0.69	-1.99

Atmospheric Pressure.

Full information is given in the annual Reports formerly published by the Department of the barometers in use at Indian observatories and of the methods of reducing the observations and obtaining the mean daily pressures (*e.g.*, pages 58 and 59 of the Report for 1890).

In Table II of each monthly review, the monthly mean pressure (corrected for temperature) is given in the fifth figure column, and in the sixth figure column the variation from the normal for each station. The variation data are obtained by a comparison of the actual monthly means with the corresponding normal monthly means published in the last two annual reports (*i. e.* Table XV in the Reports for 1889 and 1890). These normal monthly means will be used for comparison until 1894 probably, when they will be revised up to date. The figures in these two columns (*viz.*, the fifth and sixth of Table II in the monthly reviews) are strictly comparable with the corresponding data of previous years published in the annual reports. In the seventh column of Table II in each monthly review the mean pressures reduced to sea level and corrected to constant gravity (Lat. 45°) are given. These, it should be noted, are not comparable with the sea-level pressure values of past years in the annual reports as, previously to

1891, no corrections were applied to reduce the monthly pressure means to standard gravity. In Table I of each monthly review the pressure data are given for a fixed hour (*viz.*, 8 A.M.) of the day. The second figure column gives the mean 8 A.M. pressure for the month corrected for temperature. In the third figure column the variations of the mean 8 A.M. pressure from the normal mean 8 A.M. pressure are exhibited.

Normal 8 A.M. mean monthly data for the great majority of stations will be found in the Annual Summary of 1891, Tables VII and IX.

Mean annual pressure data for the year 1893 will be found under the headings "Pressure" in Tables I and II appended to the present annual summary.

The following tables give geographical summaries of the pressure variation data according to the two groups of divisions employed in the corresponding tables of temperature variation data; that is, for the nineteen divisions for which variation data were given in the "Geographical Summaries" in the annual Reports previous to 1891 and for the eleven meteorological provinces in Table I of each monthly review :—

TABLE IV.—Geographical Summary of the pressure variation data of Table II of the monthly reviews of 1893.

METEOROLOGICAL PROVINCE.	Number of stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
		"	"	"	"	"	"	"	"	"	"	"	"	"
North-West Himalayas	6-7	-0.81	-0.51	-0.19	0	-0.01	-0.01	-0.15	+0.06	-0.30	-0.19	+0.23	+0.15	-0.14
Sikkim Himalaya and Nepal	2-3	-0.45	-0.04	+0.09	-0.11	-0.07	+0.27	-0.04	+0.12	-0.28	-0.09	+0.27	+0.38	0
Punjab Plains	4	-0.50	+0.26	+0.23	-0.28	-0.09	+0.32	+0.14	+0.12	-0.28	-0.20	+0.41	+0.09	+0.02
Gangetic Plain	7-9	-0.39	+0.34	+0.38	-0.19	+0.04	+0.41	+0.17	+0.01	-0.28	-0.20	+0.39	+0.24	+0.08
Western Rajputana	3	-0.51	+0.24	+0.11	-0.21	-0.07	-0.05	+0.18	+0.15	-0.38	-0.15	+0.28	-0.03	-0.04
Eastern Rajputana and Central India	4	-0.48	+0.09	+0.21	-0.30	+0.02	+0.11	+0.32	+0.08	-0.32	-0.15	+0.35	+0.14	+0.01
Nerbudda Valley	3	-0.37	+0.06	+0.11	-0.26	-0.12	-0.03	+0.29	-0.12	-0.31	-0.25	+0.02	+0.12	-0.07
Chota Nagpur	1	-0.43	+0.12	+0.14	0.27	-0.09	+0.39	+0.33	+0.06	-0.38	-0.19	+0.28	+0.05	0
Lower Bengal	3-5	-0.31	+0.44	+0.47	-0.09	-0.30	+0.48	+0.36	+0.07	-0.39	-0.13	+0.35	+0.21	+0.10
Assam and Cachar	3	-0.40	+0.22	+0.26	-0.02	-0.41	+0.35	+0.12	-0.02	-0.31	-0.24	+0.34	+0.37	+0.02
Orissa	2	-0.38	+0.21	+0.41	-0.26	-0.73	+0.43	+0.28	-0.16	-0.77	-0.21	+0.32	+0.13	-0.06

TABLE IV.—*Geographical Summary of the pressure variation data of Table II of the monthly reviews of 1893.*
—concluded.

METEOROLOGICAL PROVINCE.	Number of stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
		"	"	"	"	"	"	"	"	"	"	"	"	"
Central Provinces South and Berar	5	-.042	-.004	+.022	-.019	-.025	+.002	+.029	+.004	-.020	-.015	+.019	+.014	-.003
Konkan	3	-.036	+.018	0	-.004	-.001	-.011	+.011	+.015	+.005	-.003	+.004	+.026	+.002
Malabar Coast	1	-.032	+.012	-.014	-.004	+.004	-.016	-.020	+.011	+.008	-.010	-.004	+.013	-.004
Deccan, Hyderabad and Mysore	6	-.039	-.003	0	-.003	-.018	-.006	+.004	+.014	0	-.010	+.016	+.025	-.002
East Coast and Carnatic	4	-.038	-.005	+.002	-.021	-.024	0	-.009	-.003	-.019	-.013	+.010	+.019	-.008
Arakan and Pegu	4	-.038	-.001	+.007	-.018	-.024	+.024	+.011	-.010	-.031	-.013	+.040	+.026	-.002
Bay Islands	1	-.040	-.003	-.013	-.026	-.012	+.015	-.025	-.001	-.016	-.015	+.023	+.017	-.011
Extra-Tropical India	37-42	-.048	+.013	+.019	-.015	-.009	+.023	+.015	+.005	-.032	-.018	+.030	+.018	0
Tropical India	26	-.039	+.002	+.008	-.014	-.023	+.004	+.009	+.003	-.017	-.012	+.019	+.020	-.003
Whole India	63-68	-.045	+.009	+.015	-.015	-.014	+.015	+.012	+.004	-.027	-.016	+.026	+.019	-.001

TABLE V.—*Variation of the mean pressure of each month of 1893 from the normal in the eleven meteorological provinces of India.*

METEOROLOGICAL PROVINCE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
	"	"	"	"	"	"	"	"	"	"	"	"	"
Burma Coast and Bay Islands	-.043	-.019	-.008	-.019	-.022	+.018	+.005	-.015	-.023	-.015	+.057	+.040	-.004
Burma Inland	-.019	+.004	+.017	?	-.003	+.026	+.008	-.008	-.024	+.002	+.065	?	+.007
Assam	-.042	+.015	+.027	+.005	-.038	+.040	+.021	+.010	-.012	-.005	+.068	+.065	+.013
Bengal and Orissa	-.040	+.021	+.035	-.004	-.045	+.045	+.033	+.009	-.034	-.013	+.058	+.036	+.008
Gangetic Plain and Chota Nagpur	-.040	+.026	+.034	-.013	-.001	+.037	+.024	+.006	-.035	-.016	+.046	+.023	+.007
Upper Sub-Himalayas	-.046	+.023	+.032	-.010	+.015	+.039	-.009	+.012	-.024	-.014	+.054	+.023	+.008
Indus Valley and North-West Rajputana	-.058	+.018	+.016	-.026	-.004	+.008	+.004	+.023	-.030	-.007	+.044	+.002	-.001
East Rajputana, Central India and Gujarat	-.041	+.017	+.015	-.015	+.013	-.006	+.030	+.026	-.024	-.003	+.032	+.024	+.006
Deccan	-.042	0	+.017	-.011	-.004	-.005	+.037	+.009	-.019	-.012	+.031	+.033	+.003
West Coast	-.039	+.004	-.014	-.012	-.005	-.020	-.009	+.016	-.005	-.009	+.009	+.030	-.005
South India	-.039	-.014	-.002	-.018	-.020	+.002	-.005	+.012	-.008	-.018	+.018	+.032	-.005

The following gives a summary of the more important features of the distribution of pressure in India during the year 1893.

I. The Cold weather Period.—The mean pressure of the Indian area in January was considerably in defect and in February it was practically normal in amount. The weather was unusually disturbed in Northern and Central India, the number of cold weather disturbances above the average, and the precipitation largely in excess. As stated in last year's annual review, the pressure variations at the level of the plains in the cold weather are not directly related to the more important abnormal weather features of the period during which they occur. There is a slight tendency to increased pressure during stormy weather, and this was shown in February and March 1893, when pressure was also more largely in excess in the area

of disturbed weather conditions in Northern and Central India than elsewhere. The pressure variations in the cold weather are chiefly, if not solely, the resultant of two effects, one due to the general actions or conditions in Southern Asia determining the disturbed weather of the period, and the other due to the temperature conditions in India following, and determined in part at least by this disturbed weather.

The most important feature of the pressure condition of the cold weather period of 1893 was the very large deficiency of pressure at the hill stations. The deficiency was not very large absolutely, but was important in comparison with that which obtained at the nearest plain stations. It was, moreover, the continuation of conditions initiated during the retreat of the south-west monsoon currents from the Indian area in 1892.

The following table gives the vertical pressure anomalies as determined from the pressure variations of nine pairs of stations for the period September 1892 to February 1893. When the pressure variation at the hill station is algebraically less than at the corresponding plain station, the vertical pressure anomaly is negative, and *vice versa* :—

MONTH.	VERTICAL PRESSURE ANOMALY.									
	Quetta and Jacobabad.	Leh and Lahore.	Kailang and Lahore.	Murree and Peshawar.	Simla and Ludhiana.	Darjeeling and Calcutta.	Mount Abu and Deesa.	Wellington and Cochin.	Pachmarhi and Nagpur.	
September 1892	+ '037	+ '013	+ '034	— '024	+ '015	+ '004	?	+ '005	— '012	
October "	+ '012	+ '024	+ '014	— '002	— '003	+ '004	?	+ '012	— '012	
November "	+ '007	— '001	+ '015	— '003	+ '009	+ '013	?	+ '018	— '010	
December "	— '010	— '006	?	— '025	— '006	— '016	?	+ '013	— '011	
January 1893	— '020	— '064	— '031	— '045	— '046	— '020	— '006	+ '017	— '018	
February "	— '079	— '113	— '115	— '081	— '085	— '060	— '063	+ '003	— '023	
Mean of period	— '009	— '025	— '017	— '030	— '019	— '013	?	+ '011	— '014	

A reference to last year's annual review shows that pressure was very considerably in excess at the hill stations in Northern India during the cold weather and hot weather periods (from January to May 1892), and in slight to moderate excess during the south-west monsoon period. The preceding data establish that it was in slight excess in September 1892, and that the relative or vertical pressure anomalies tended to change sign in October and November, and were negative during the period December 1892 to February 1893 for all the pairs of stations in Northern India given in the preceding table. This relative deficiency of pressure was comparatively small in December and was large in January and very large in February. The chief features of this deficiency of pressure at the high level stations were as follows :—

- 1st.—It was largest in amount at the highest or most elevated stations (*i.e.* at Leh and Kailang).
- 2nd.—It increased westwards along the Himalayas at the mean elevation of 7,000 feet. It was greater at Murree and Simla than at Rani-khet and Chakrata, and greater at all these stations than at Darjeeling.
- 3rd.—It decreased southwards at the same level, and pressure was steadily throughout the period in relative excess at the hill stations of Wellington and Newera Eliya in Southern India and Ceylon.
- 4th.—The deficient pressure represented persistent abnormal conditions, which probably originated or commenced during the previous retreating south-west monsoon period, and

developed rapidly during the months of January and February 1893.

Persistent deficiency of pressure in Northern India during the cold weather period at the hill stations, more especially when compared with the neighbouring plain stations, is invariably associated with abnormally disturbed weather and with unusually heavy precipitation in the hill districts and plains of Northern India. The cold weather of 1892-93 was as striking an example of this relation as that of 1890-91 whilst the intermediate cold weather of 1891-92 was as remarkable an example of the inverse aspect of this relation, *viz.*, excessive pressure at the hill stations accompanying deficient rainfall, and absence of cold weather storms.

Pressure at the level of the plains was in very slight relative defect in Northern India and in relative excess in the Peninsula during the month of January 1893. The anomalies in the two cases were so very small as to show they were of no importance or significance. Pressure was in the month of February, on the other hand, relatively in moderate defect in the Peninsula and in slight to moderate excess in Northern India.

The following gives the mean pressure variations in Extra Tropical and Tropical India and the pressure anomalies of these areas relatively to the whole of India during this period :—

	Actual mean pressure variation from normal.			Pressure anomaly or relative pressure variation.	
	January.	February.	Period.	January.	February.
Extra Tropical India .	— '048	+ '013	— '018	— '003	+ '004
Tropical India .	— '039	+ '002	— '019	+ '006	— '007

The local pressure anomalies were hence so small as to be of no significance in interpreting the broad features of the weather of the season and their relations to each other.

II. The Hot-weather Period.—Weather was unusually disturbed in Northern India during the month of March and the snow accumulation in the Himalayan and Afghan mountain areas was large in amount. Weather was unusually fine and settled during the months of April and May and the abnormal snow accumulation disappeared very rapidly and ceased to affect the meteorological conditions in India to any marked extent in May. The following gives the more important features of the pressure conditions during this period :—

- 1st.—The mean pressure of the Indian land area was in slight general excess in March and in slight

defect in April and May, and was on the average of the whole period normal in amount :—

MONTH.	Variation of mean 8 A.M. pressure of Indian land area from the normal.
March 1893	+ '017
April „	— '013
May „	— '011
Mean of period, March to May	— '002

2nd.—The pressure anomalies or local pressure conditions in March were similar to those which obtained in the month of February, that is, pressure was, relatively to the general condition, in slight to moderate excess in Northern India, and in slight to moderate defect in the Peninsula. The following data illustrate this contrast of conditions fully. Corresponding pressure anomaly data are given for the preceding month of February in order to show that the conditions in March were the continuation of similar conditions established in February :—

	Mean pressure variation from normal, March 1893.	PRESSURE ANOMALY.	
		March 1893.	February 1893.
	"	"	"
Burma Inland	+ '017	0	— '004
Assam	+ '027	+ '010	+ '007
Bengal and Orissa	+ '035	+ '018	+ '013
Gangetic Plain and Chota Nagpur.	+ '034	+ '017	+ '010
Upper Sub-Himalayas	+ '032	+ '015	+ '015
Indus Valley and N.W. Rajputana.	+ '016	— '001	+ '010
East Rajputana, Central India and Gujarat.	+ '015	— '002	+ '009
Deccan	+ '017	0	— '008
West Coast	— '014	— '031	— '004
South India	— '002	— '019	— '022
Burma Coast and Bay Islands.	— '008	— '025	— '027

The contrast between the pressure conditions in Tropical and Extra Tropical India was hence sharply defined.

3rd.—The local pressure variations or anomalies were small in April and were evidently transitional to the large anomalies which characterised the month of May. The conditions in that month were practically the opposite to those in March, *i. e.*, pressure was relatively in defect over the greater part of Extra-Tropical India and in excess in Tropical India, conditions which it may be noted were, on the whole,

favourable to a normal or strong monsoon. The following gives data for that month :—

	Variation of mean 8 A.M. pressure, May 1893, from normal.	Pressure anomaly, May 1893.
	"	"
Assam	— '038	— '027
Bengal and Orissa	— '045	— '034
Gangetic Plain and Chota Nagpur.	— '001	+ '010
Upper Sub-Himalayas	+ '015	+ '026
Indus Valley and North-West Rajputana.	— '004	+ '007
East Rajputana, Central India and Gujarat.	+ '013	+ '024
Deccan	— '004	+ '007
West Coast	— '005	+ '006
South India	— '020	— '009

The chief features in May were hence large local deficiency of pressure in North-East India, and moderate excess in North-Western and Central India.

4th.—The relations between the pressure variations at the hill stations and the neighbouring plain stations were both remarkable and interesting. During the stormy period of the first three weeks of March pressure was largely in defect at the hill stations as compared with the neighbouring plains. It then increased very rapidly at the hill stations relatively to the plains, and was in moderate to large relative excess during the months of April and May. This change was immediately antecedent to and accompanied the termination of abnormal cold weather conditions, and the establishment in the plains and hill districts of Northern India of hot weather conditions, which were on the whole favourable to the establishment of the south-west monsoon about its normal date.

The following table gives vertical pressure anomalies as determined from the pressure variations of eight pairs of stations :—

HILL AND PLAIN STATIONS.	VERTICAL PRESSURE ANOMALY.			Mean of Period.
	March 1893.	April 1893.	May 1893.	
	"	"	"	"
Quetta and Jacobabad	— '011	+ '048	+ '001	+ '013
Leh and Lahore	— '063	+ '074	+ '014	+ '008
Murree and Peshawar	— '048	+ '021	+ '020	— '002
Simla and Ludhiana	— '051	+ '027	+ '013	— '004
Ranikhet and Lucknow	— '010	+ '037	+ '016	+ '014
Darjeeling and Dhubri	— '041	— '015	+ '037	— '006
Mount Abu and Deesa	— '012	+ '003	— '015	— '008
Pachmarhi and Nagpur	— '050	+ '007	+ '019	— '008
Mean vertical pressure anomaly as determined from the data of eight pairs of stations	— '036	+ '025	+ '013	+ '001

III. The South-West Monsoon Period.—The pressure conditions varied considerably from month to month during this period, and there was no general persistent abnormal feature throughout the whole period, except that of a moderate deficiency of pressure at the hill stations relative to the plains.

The mean pressure of the whole of India was above the normal for the three months of June, July and August, and in moderate defect in September. The following gives data:—

MONTH.	VARIATION FROM NORMAL.			
	Whole of India, from Table I.	Whole of India, from Table II.	Extra-Tropical India, from Table II.	Tropical India, from Table II.
June	+ '016	+ '015	+ '023	+ '004
July	+ '015	+ '012	+ '015	+ '009
August	+ '011	+ '004	+ '005	+ '003
September	— '022	— '027	— '032	— '017

The preceding data show that the variations were the same in character in Tropical and Extra-Tropical India, but that they were throughout larger in the latter than in the former area.

Pressure was persistently in defect throughout the whole period at the hill stations in Northern India as compared with the neighbouring plain stations; but, as almost invariably happens during the south-west monsoon period, these pressure variations diminished and almost disappeared before the termination of the rains. The following gives vertical pressure anomalies for six pairs of stations:—

PAIR OF STATIONS.	VERTICAL PRESSURE ANOMALY IN				Mean of period.
	June.	July.	August.	September.	
	"	"	"	"	"
Leh and Lahore	— '077	— '049	— '025	+ '015	— '004
Murree and Peshawar	— '042	— '038	— '031	— '028	— '035
Quetta and Jacobabad	— '003	+ '009	+ '021	Nil	+ '007
Simla and Ludhiana	— '035	— '014	— '005	— '015	— '017
Darjeeling and Calcutta	— '029	— '050	+ '001	+ '011	— '017
Mount Abu and Deesa	— '006	— '032	— '012	— '014	— '016
Mean of month	— '032	— '029	— '009	— '005	— '019

Pressure was, during the months of April and May, in relative excess at the hill stations, but in June the pressure relations reverted to those which had obtained during the preceding cold weather.

Pressure was relatively to the general condition in slight excess during the month of June in Burma and Northern India and in defect in the Peninsula, the deficiency being most marked at the west coast stations, hence probably indicating a general deficiency of pres-

sure in the west coast districts and the neighbouring sea area.

Pressure in the month of July was in relative defect in North-Western and also in Southern India and in relative excess in the intermediate area. The pressure anomalies were moderately large in amount and exceeded '025" in the Punjab, South Madras and Mysore, where they were negative and also in South-West Bengal, the Central Provinces, Berar and Central India, where they were positive. These pressure anomalies were associated with a very abnormal distribution of the rainfall of the period.

The pressure anomalies of the month of August were small in amount for the whole of India. There was a moderate local excess of pressure in Upper Sind and Baluchistan, and a moderate deficiency averaging '03" in Lower Burma.

The local variations of pressure were large in September. Pressure was in slight to moderate excess relative to the general condition in the Peninsula and in general defect in Northern India, the deficiency being unusually large in Orissa, Chota Nagpur and the eastern districts of the Central Provinces. The relative deficiency averaged '045" in Orissa and '041" at Sambalpur in the Central Provinces. The axis of this belt or trough of deficient pressure ran from False Point to Allahabad or Sutna and coincided closely with the track of the first of a series of cyclonic storms which occurred during the month in the Bay and Northern India.

IV. The retreating South-West Monsoon period.—The mean pressure of the Indian area was in defect in October and in excess in November and December. The following gives data:—

MONTH.	VARIATION FROM NORMAL.			
	Whole of India, from Table I.	Whole of India, from Table II.	Extra-Tropical India, from Table II.	Tropical India, from Table II.
	"	"	"	"
October	— '011	— '016	— '018	— '012
November	+ '039	+ '026	+ '030	+ '019
December	+ '029	+ '019	+ '018	+ '020

Hence as in the preceding south-west monsoon period, the pressure variations were the same in character in Extra-Tropical and Tropical India but differed slightly in amount.

Pressure was in slight relative excess at the hill stations in October and December, and in slight to moderate defect in November.

The following gives data for seven pairs of stations:—

PAIR OF STATIONS.	VERTICAL PRESSURE ANOMALY IN			MEAN OF PERIOD.
	October.	November.	December.	
	"	"	"	"
Leh and Lahore	+ '002	— '009	+ '041	+ '011
Kailang and Lahore	+ '011	— '018	+ '015	+ '003
Murree and Peshawar	+ '006	0	+ '020	+ '009
Quetta and Jacobabad	+ '018	— '011	+ '041	+ '016
Simla and Ludhiana	— '002	— '019	+ '008	— '004
Chakrata and Roorkee	— '009	— '041	— '043	— '031
Darjeeling and Calcutta	+ '016	0	+ '017	+ '011
Mean of month	+ '006	— '014	+ '014	+ '002

The pressure anomalies of the month of October were very small in amount and the relative distribution of pressure was approximately normal. There was a very slight tendency to increased or excessive pressure in Assam and Upper Burma and to deficient pressure in the Deccan.

The most marked abnormal feature of the months of November and December was a considerable local excess of pressure in Assam and Upper Burma. The following gives data for representative stations in that area:—

STATION.	PRESSURE ANOMALY.		MEAN OF PERIOD.
	November.	December.	
	"	"	"
Sibsagar	+ '036	+ '044	+ '040
Silchar	+ '021	+ '027	+ '024
Toungoo	+ '018	+ '021	+ '020

This feature obtained its greatest development during the cold period of the first fortnight of December in Burma.

In the month of November pressure was relatively in defect in the Peninsula, more especially in the southern and western districts and in excess in North-Western India, and in December pressure was in relative excess in the Peninsula and in defect in North-Western India. The following data illustrate these features in the pressure conditions of the two months:—

DISTRICT.	MEAN PRESSURE ANOMALY.	
	November.	December.
	"	"
Punjab	+ '015	— '010
Sind and Rajputana	+ '006	— '014
Bombay	— '022	+ '007
South Madras	— '016	Nil.
Deccan	— '010	+ '006

These pressure anomalies were related to the distribution of rainfall during these months.

The year.—The mean pressure of the whole of India agreed very closely with the normal, being only '001" in defect. The mean for Extra-Tropical India was identical with the normal, and the mean for Tropical India was '003" in defect. The only areas in which the mean pressure of the year differed by '010" or upwards from the normal were the North-West Himalayas, the Bay Islands and Bengal. The following gives data for these three areas:—

AREA.	VARIATION FROM NORMAL OF THE MEAN PRESSURE OF THE YEAR.
	"
North-West Himalayas	— '014
Bay Islands	— '011
Lower Bengal	+ '010

Hence there was a marked tendency throughout the year to deficient pressure in the Western Himalayan mountain area and in the south-east of the Bay, and to increased pressure in North-Eastern India.

The following gives the mean monthly variations of the pressure of the whole of India from the normal, as deduced from the mean 8 A.M. monthly values and also from the mean monthly values as obtained from the observations at 10 A.M. and 4 P.M.:—

MONTH.	MEAN VARIATION OF PRESSURE OVER WHOLE INDIA FROM THE NORMAL.	
	From 8 A.M. observations.	From 10 A.M. and 4 P.M. observations.
	"	"
January	— '043	— '045
February	+ '008	+ '009
March	+ '017	+ '015
April	— '013	— '015
May	— '011	— '014
June	+ '016	+ '015
July	+ '015	+ '012
August	+ '011	+ '004
September	— '022	— '027
October	— '011	— '016
November	+ '039	+ '026
December	+ '029	+ '019
Year	+ '003	— '001

The mean pressure of the year was hence almost identical with the normal. It was in excess in seven months and in defect in five months, the period of the oscillatory movements indicated by the monthly means being four months.

The following table gives the monthly variations of pressure at four hill stations for comparison with the mean variation of pressure at the level of the plains of India:—

MONTH.	VARIATION OF MEAN PRESSURE OF MONTH OR PERIOD FROM NORMAL.				
	Plains of India.	Leh.	Quetta.	Murree.	Simla.
January.	-.043	-.107	-.071	-.102	-.091
February.	+.008	-.082	-.035	-.064	-.060
March.	+.017	-.031	+.018	-.028	-.032
April.	-.013	+.050	+.038	-.009	-.009
May.	-.011	+.014	-.009	-.001	+.004
June.	+.016	-.033	+.001	+.002	+.003
July.	+.015	-.037	+.005	-.020	-.009
August.	+.011	-.025	+.046	+.007	+.010
September.	-.022	-.013	-.034	-.050	-.040
October.	-.011	-.017	+.004	-.019	-.017
November.	+.039	+.025	+.030	+.034	+.032
December.	+.029	+.043	+.030	+.020	+.030
Mean of year.	+.003	-.018	+.002	-.019	-.015

The preceding table shows that there was a slight tendency for the variations at the hill stations to be opposite in character to those at the plain stations, and that this tendency was on the whole most strongly marked at the most elevated station, *viz.*, Leh.

The following gives variation data for the stations of Zanzibar, Aden, Bushire, Sibsagar, Moulmein and Colombo for comparison with the mean variation of pressure in India. The data indicate that the larger variations were common to the whole Indian monsoon region:—

MONTH.	VARIATION OF MEAN PRESSURE OF MONTH OR PERIOD FROM NORMAL.						
	Indian area.	Zanzibar.	Aden.	Bushire.	Sibsagar.	Moulmein.	Colombo.
January.	-.043	-.039	-.081	-.052	-.035	-.046	-.028
February.	+.008	+.021	-.016	+.043	+.005	-.019	+.015
March.	+.017	-.003	-.007	+.023	+.008	-.009	-.018
April.	-.013	+.004	-.013	-.002	0	-.002	-.012
May.	-.011	+.005	-.047	-.046	-.032	-.011	+.014
June.	+.016	?	-.031	-.029	+.049	+.015	-.021
July.	+.015	-.027	-.022	+.015	+.011	+.007	-.032
August.	+.011	+.034	+.019	+.029	+.020	-.023	+.024
September.	-.022	-.012	-.027	-.036	+.012	-.016	+.008
October.	-.011	-.013	-.006	+.004	+.002	-.020	-.005
November.	+.039	+.025	+.032	+.028	+.075	+.061	+.004
December.	+.029	+.008	-.039	-.021	+.073	+.039	+.020
Year.	+.003	?	-.020	-.004	+.016	-.002	-.003

The following table gives the mean variation of pressure in the Indian area from the normal for each year from 1875 to 1893:—

Year.	Mean variation of pressure over whole of Indian area.
1875.	-.007
76.	-.007
77.	+.032
78.	+.002
79.	-.014
80.	-.003
81.	+.002
82.	-.010
83.	-.005
84.	+.010
85.	+.014
86.	-.003
87.	-.006
88.	+.011
89.	+.004
90.	-.009
91.	+.010
92.	-.022
93.	-.001

The following gives a statement of the cyclones and more important cyclonic storms which affected the Indian area during the south-west monsoon of 1893 drawn up in the form adopted in the annual reports of the Meteorology of India for the years 1886-90. The tracks of these storms are laid down in Plate VI.

No.	Year.	Month.	Date.	Greatest observed barometric depression.	Character of storm.	Details of storm.
1	1893	April	25th to 27th.	3"	Feeble storm.	This storm formed a little to the north-west of the Andamans on the 25th and 26th in front of a feeble advance of southerly humid winds up the Bay. It advanced north-north-eastwards to the Burma Coast, which it crossed to the west of Rangoon about 6 A.M. of the 27th. It broke up rapidly during the day.
2	Ditto.	May	21st to 9th	1.4"	Very severe cyclone.	This was the most severe storm that has occurred in the north of the Bay in the month of May during the past 25 years. It was generated off the Orissa Coast in front of an advance of humid winds on the 21st. It intensified steadily during the next three days, at the same time moving very slowly northwards, and on the morning of the 25th had developed into a

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No.	Year.	Month.	Date.	Greatest observed barometric depression.	Character of storm.	Details of storm.	No.	Year.	Month.	Date.	Greatest observed barometric depression.	Character of storm.	Details of storm.							
3	1893	June	11th to 18th	28"	Feeble cyclonic storm.	<p>cyclone with a calm centre and inner storm area of hurricane winds. Its rate of motion increased from one mile on the 23rd to six miles per hour on the morning of the 26th. The calm centre crossed the coast a few miles west of Saugor Island at 4-30 A.M. of the 26th, and marched in a northerly direction to the neighbourhood of Burdwan, where it recurved from north to east-north-east during the evening of the 26th. The centre was a little to the north of Calcutta at 8 A.M. of the 27th and to the north-west of Dacca on the morning of the 28th. The storm broke up in Cachar on the 29th.</p> <p>Exceedingly stormy weather prevailed in the north of the Bay on the 25th and 26th and winds of hurricane force were experienced by the ship <i>Port Glasgow</i>, the Pilot vessel <i>Sarsuti</i>, and several other vessels. The storm was chiefly remarkable for the excessive rainfall it gave to Orissa, South and East Bengal, Cachar and Manipur, and for its unusual track in Bengal.</p> <p>This shallow depression formed to the north-west of the Andamans on the 11th and 12th, and marched slowly across the Bay in a west-north-westerly direction towards the Circars Coast, which it crossed between Vizagapatam and Cocanada shortly after noon on the 15th. It continued to advance in the same direction, and on the morning of the 16th the centre was close to Chanda. It now began to recurve to north and was almost stationary during the next 18 hours. It however marched northwards on the 17th and was close to Sutna on the morning of the 18th. A residual depression lay over Baghelkhand during the next two days and filled up on the 21st. Winds of force 7 to 9 were experienced in the west of the Bay during its existence. The storm, although</p>	4	1893	July and August.	29th July to 5th August.	23"	Feeble cyclonic storm.	<p>of moderate intensity, determined a strong influx of humid winds to Northern and Central India.</p> <p>This feeble storm formed slowly at the head of the Bay on the last three days of the month of July and on the 1st August covered the north-west angle of the Bay with its centre near the Orissa coast. It began to move north-westwards, and the centre was near Balasore on the morning of the 2nd. It advanced through Orissa into Chota Nagpur during the afternoon and night, and the centre was in about Lat. 23° N. and Long. 83° E. at 8 A.M. of the 3rd. It continued to march in the same direction during the next 24 hours, and was between Saugor and Nowgong at 8 A.M. of the 4th. It broke up during the day. It was throughout a feeble disturbance. The indraught to it from the west coast, however, gave a moderately heavy burst of rain to the Central Provinces and Central India. Winds of force 6 to 8 were experienced on the 1st and 2nd August in the Bay.</p>	5	1893	September.	1st to 5th.	34"	Feeble cyclonic storm.	<p>This storm formed on the 30th and 31st August in the north-west angle of the Bay. It developed on the 1st and 2nd and began to advance north-westwards on the afternoon of the 2nd towards the North Orissa Coast, which it crossed to the south-west of Balasore about noon of the 3rd. It advanced rapidly along the trough of low pressure during the next 24 hours, and the centre was in about Lat. 25½° N. and Long. 80° E. on the morning of the 4th and between Delhi and Meerut on the morning of the 5th. It broke up rapidly during the day at the foot of the hills. The storm determined a general burst of rain to Bengal and the Gangetic Plain. Winds of force 8 to 9 were experienced in the centre of the Bay on the 2nd.</p>

No.	Year.	Month.	Date.	Greatest observed barometric depression.	Character of storm.	Details of storm.	No.	Year.	Month.	Date.	Greatest observed barometric depression.	Character of storm.	Details of storm.
6	1893	September	9th to 19th.	'44"	Cyclonic storm of considerable intensity.	This storm formed in the north of the Bay on the 7th and 8th, that is, immediately after the dispersion of the previous storm. It intensified steadily on the 9th, and on the 10th was a storm of considerable intensity and extent. It began to move in a west-north-west direction. The centre crossed the Orissa Coast nearly midway between Saugor Island and Balasore at 9 A.M. of the 11th and advanced slowly westwards and was near Sambalpur on the morning of the 12th and between Sutna and Jubbulpore on the 13th. It passed through Central India on the 14th into South-West Rajputana on the 15th, when it developed considerably. It now began to recurve from west through north-west to north and north-east. The centre was to the north-west of Deesa on the morning of the 16th and nearly midway between Sirsa and Mooltan on the 18th, and near Ludhiana on the 19th. It broke up during the next 24 hours over the Simla hills. It was a very long-lived storm, and was remarkable for the heavy down-pour it gave to South-West Rajputana and the submontane districts of the Punjab on the 18th and 19th. The strongest winds experienced in the north of the Bay during the storm were of force 9.							
7	1893	September	21st to 26th.	'51"	Cyclonic storm of moderate intensity.	This storm originated in the north-west of the Bay on the 20th. It intensified on the 21st and on the morning of the 22nd was a storm of moderate severity. It advanced in a west-north-west direction towards the Orissa coast, which it crossed between False Point and Pooree about 4 A.M. of the 23rd. It thence marched by a curved path through the Sambalpur district of the Central Provinces on the 24th into the Shahabad district of Bihar on the 25th, and into the Champaran district on the 26th when it broke up. The storm gave a heavy burst of rain to Bengal,							
8	1893	October	19th to 22nd.	Upwards of one inch.	A small cyclone of great intensity.	This storm formed to the south-west of Diamond Island on the 19th. It intensified considerably on the 20th and began to advance in a north-north-west direction and on the afternoon of the 21st it was a cyclone of small extent but great intensity with an inner area of hurricane winds. It recurved slightly to east, and on the morning of the 22nd it was moving in a north-north-east direction towards the mouth of the Megna. The centre passed over or near Noakhali about 11-30 A.M. and near Comilla about 1-30 P.M. and advanced into Cachar during the evening, where it filled up very rapidly. It was accompanied by a storm wave at the mouth of the Megna which did much damage. The Ship <i>Woodburn</i> which was in the inner storm area on the evening of the 21st, and the early morning of the 22nd experienced hurricane winds and tremendous high seas, and was damaged severely. The storm gave a moderately heavy burst of rain to Assam, East Bengal and Upper Burma.							
9	1893	October	24th to 28th.	'36"	Cyclonic storm of considerable intensity.	This storm almost certainly originated outside the Indian area and marched westwards across the Malayan Peninsula. It entered the Andaman sea as a feeble depression on the 24th and developed in that area into a cyclonic storm of considerable intensity on the 25th. The centre advanced westwards to the neighbourhood of Port Blair on the afternoon of the 26th. It then began to recurve and marched in a north-westerly direction. The centre was probably in about Lat. 13½° N. and Long. 93° E. on the morning of the 27th. It was then passing out of the Andaman Sea into the Bay of Bengal through the Coco Channel. It continued							

No.	Year.	Month.	Date.	Greatest observed barometric depression.	Character of storm.	Details of storm.	No.	Year.	Month.	Date.	Greatest observed barometric depression.	Character of storm.	Details of storm.			
10	1893	November	5th to 8th.	41"	Cyclone of small extent and considerable intensity.	<p>to recurve and to march northwards during the day, and on the morning of the 28th was to the west of Diamond Island in Lat. 16° N. and Long. $92\frac{1}{2}^{\circ}$ E. It crossed the South Arakan Coast in the evening and broke up rapidly on the morning of the 29th. It gave a heavy burst of rain to Lower and Central Burma. Winds of force 7 to 8 were experienced by vessels upwards of 150 miles from the centre on the 28th.</p> <p>This storm was generated to the east of the South Coromandel coast on the 4th. It developed rapidly during the day and on the morning of the 5th was a storm of considerable intensity with its centre in about Lat. $11\frac{1}{2}^{\circ}$ N. and Long. $81\frac{1}{2}^{\circ}$ E. The centre advanced during the day in a west-north-west direction towards the South Coromandel coast which it crossed at the Seven Pagodas at 6-30 A.M. on the 6th. It was at this stage a cyclone of small extent with a calm central area and an inner area of hurricane winds. It, however, filled up rapidly during the day. The storm gave heavy and general rain to the Decan and Madras. Winds of force 6 to 10 were experienced by several vessels in the south-west of the Bay on the 5th and early morning of the 6th.</p>										<p>to north during the day and moved very slowly during the day and on the morning of the 18th was in about Lat. $17\frac{1}{2}^{\circ}$ N. and Long. 65° E. or about 60 miles to the north of its position at 8 A.M. of the previous day. The S.S. <i>Nasari</i> and <i>Imperator</i> nearest to the centre on this day experienced winds of force 11. The centre advanced at an average rate of 6 miles per hour during the day towards the Kathiawar Coast, and on the morning of the 19th was in Lat. $18\frac{1}{2}^{\circ}$ N. and Long. 67° E. It had commenced to fill up slowly. It, however, continued to advance north-eastwards, and on the morning of the 20th was a little to the west of Verawal. It could not surmount the Aravali hills and broke up during the next 24 hours. Winds of force 8 to 11 were experienced by ships in the storm area.</p>
11	1893	November	13th to 21st.	4"	Severe cyclonic storm.	<p>This storm was generated in an area of unsettled squally weather in the south-east of the Arabian sea on the 13th and 14th. It intensified on the 15th, and on the morning of 16th was a cyclonic storm of moderate extent and depth with its centre in about Lat. 15° N. and Long. $67\frac{1}{2}^{\circ}$ E. It marched in a north-westerly direction during the next 24 hours, and on the morning of the 17th the centre was in about Lat. $16\frac{1}{2}^{\circ}$ N. and Long. $65\frac{1}{2}^{\circ}$ E. It was at this stage a storm of very considerable intensity. The centre began to recurve</p>		1893	June	24th to 30th.	3"	Land-formed cyclonic storm of moderate intensity.	<p>This land-formed storm was generated during a heavy burst of rainfall in East Bengal on the 22nd and 23rd. The centre was near Dacca on the 24th. The storm remained practically stationary during the next 24 hours, but began to march westwards on the afternoon of the 25th and the centre was near Jessore at 8 A.M. of the 26th. The centre continued to drift with increasing velocity during the next three days, and was in South-East Rajputana on the morning of the 29th. The depression was now filling up. It however recurved slightly to north during the next 24 hours, and was near Bikanir at 8 A.M. of the 30th. It was absorbed into the permanent low pressure area in North-Western India during the next 24 hours. The storm gave a heavy burst of rainfall to Bengal, Bihar, Chota Nagpur and the North-West Provinces. Winds of force 6 to 10 were experienced at the head of the Bay on the 26th.</p>			

Winds.

The mean direction of the wind and the mean diurnal movement of the air as measured by Robinson anemometers are given for every station in Table II in each monthly review. The normal values are also given for the sake of ready comparison. The normal data of these elements will be found in a collected form in Tables XX and XXI in the annual Report for 1890. The mean 8 A.M. wind directions for each month are laid down in the first chart in each monthly review. They are calculated in the usual manner from the 8 A.M. wind data given in Table I in each monthly review. As a general rule, the mean 8 A.M. wind directions differ little from the mean wind directions (calculated from the 10 and 16 hours wind data) given in Table II of each monthly review, but in some cases and at certain seasons of the year they differ very considerably.

The chief features of the air movement over India have been described in the monthly reviews of the year. The following gives a summary of the most important features :—

I. The Cold-weather Period.—This period was more disturbed than usual, and a large number of cold-weather storms passed across Northern India. The mean air movement of the period at the hill stations was hence considerably above the normal as is shown by the following data :—

STATION.	AIR MOVEMENT IN MILES DURING COLD WEATHER PERIOD.			
	Mean daily air movement.	Normal daily air movement.	Variation from normal.	Percentage variation.
Murree	236	197	+ 39	+ 20
Chakrata	189	120	+ 69	+ 58
Darjeeling	156	92	+ 64	+ 70
Mount Abu	132	122	+ 10	+ 8
Pachmarhi	146	83	+ 63	+ 76
Chikalda	157	131	+ 26	+ 20

If the mean of the whole be taken as a fair approximation to the effect of the storms in increasing the air motion at the hill stations, it shows that the mean air movement of the whole period at their level was nearly 50 per cent. above the normal.

A second result of the numerous storms was to give less steady but on the whole stronger winds in the plains of Northern India. It is, however, very noteworthy that this effect was not shown in the Punjab, Rajputana and the North-Western Provinces, but in North-Eastern and

Central India. The following gives mean data illustrating these features :—

DISTRICT.	STEADINESS DURING COLD WEATHER PERIOD.			AIR MOVEMENT IN MILES DURING COLD WEATHER PERIOD.		
	Mean actual percentage.	Normal percentage.	Variation from normal.	Mean daily air movement.	Normal daily air movement.	Percentage variation.
Chota Nagpur	41	60	— 19	207	156	+ 33
Bihar	26	47	— 21	108	79	+ 37
North-Western Provinces	30	37	— 7	73	74	— 1
Punjab	31	24	+ 7	53	57	— 7
Sind	58	32	+ 26	184	160	+ 15
Rajputana	24	27	— 3	126	127	— 1
Central India	36	36	0	103	79	+ 30

Winds were more northerly than usual over the greater part of Northern India and more especially in Bengal in January. The effect was most pronounced at the Himalayan hill stations in the month of February, when the snow accumulation due to the excessive fall in January produced its largest effect.

The northerly winds of the period on the Bombay Coast contained an unusually strong westerly element. Winds were more northerly (or less easterly) in the Deccan and Central Provinces, and one of the more important effects of the abnormal conditions of the period was to delay the establishment of the south-west winds in Bengal for nearly a month, *i.e.*, from the middle of February to the middle of March. The mean wind direction of the month of February in South-West Bengal was almost due north, the normal being west-south-west. It is evident that all the more abnormal features of the air movement of the period were related to the abnormal and strongly marked features of the weather.

II. The Hot-weather Period.—The month of March 1893 was characterized by the occasional occurrence of storms similar in character to those of the two preceding months, and hence it should rather be considered a continuation of the cold-weather in Northern India than the first month of the hot-weather period. Ordinary hot-weather conditions obtained in April and May. The first advance of humid south-west monsoon winds to the Indian and Burmese peninsular areas occurred earlier than usual in April and May. The most remarkable feature of this period was hence the absence of strongly marked hot-weather conditions and the earlier establishment of the south-west monsoon than usual in Southern India.

The most important features of the air motion over India in March were:—

- (1) Stronger winds than usual at the hill stations. Winds were also more frequently from northerly directions, and the mean wind directions of the month generally contained a small northerly element instead of the normal large southerly component.
- (2) Winds were remarkably unsteady and feeble in Bengal, Chota Nagpur and Bihar, and slightly less steady than usual in the North-Western Provinces, Rajputana and the Punjab. The mean wind directions did not differ largely from the normal.
- (3) Winds were also less steady and slightly feebler than usual in the Central Provinces, Berar, the North Deccan and Bombay. In the Central Provinces and Berar the mean direction of the lower air movement during the month was north-east, the normal distribution being north-west. At the hill stations in the same area the mean direction of the winds was south-west, the normal being north-west.

The chief features of the air movement in March were hence related to the very feebly marked hot-weather conditions of the month.

The more noteworthy features of the air movement in India during the months of April and May 1893 were.—

- 1st.—Winds were on the whole slightly stronger than usual over the Gangetic plain and were also less steady than usual. The following gives velocity data.—

PROVINCE.	VELOCITY.					
	APRIL.			MAY.		
	Mean daily air movement in miles.	Normal daily air movement in miles.	Percentage variation.	Mean daily air movement in miles.	Normal daily air movement in miles.	Percentage variation.
Bengal and Orissa	210	201	+ 4	195	194	+ 1
Bihar and Chota Nagpur	170	149	+ 14	168	158	+ 6
North-Western Provinces	82	86	- 5	85	91	- 7
Punjab	79	74	+ 7	82	80	+ 2
Rajputana	180	163	+ 10	239	220	+ 9
Central India	132	118	+ 12	148	140	+ 6

- 2nd.—In consequence of the feebleness of the westerly hot dry winds of the Gangetic plain the area of most unsteady and variable air motion (between the land winds of the Gangetic plain and the sea winds from the Bengal Coast), was throughout further to the west than usual. In the month of April it lay over

the western half of the North-Western Provinces instead of Bihar and the eastern districts of the North-Western Provinces; and in the month of May, it included the south-east districts of the Punjab and adjacent districts of the North-Western Provinces, its normal position being in the central districts of the North-Western Provinces.

- 3rd.—Northerly winds prevailed to an unusual extent at the hill stations. This is shown by the following data:—

STATION.	APRIL.		MAY.	
	Mean wind direction.	Normal wind direction.	Mean wind direction.	Normal wind direction.
Simla	N 5° W	S 69° W	N 10° W	S 66° W
Chakrata	W	S 68° W	N 87° W	S 63° W
Ranikhet	N 87° W	S 62° W	S 80° W	S 63° W
Darjeeling	S 81° W	S 72° W	N 56° W	S 79° W

Winds were also more northerly in Bihar and the North-Western Provinces, more especially in the month of April, but the amount of the northerly deflection was small compared with that at the hill stations. As it was a general feature and was most pronounced at the submontane stations, it is very probable that in both cases it was due to a stronger northerly drift from the Himalayan area than usual consequent on the large snow accumulation in that area.

- 4th.—Winds in April were very unsteady and feebler than usual in Lower Burma and Southern India and at Port Blair in the Andamans, but were stronger and steadier than usual in May, due chiefly to the abnormally early extension of southerly winds over the south of the Bay and to a less extent over the Arabian Sea.

III. The South-west Monsoon Period.—The south-west monsoon lower air currents were established about the normal date on the Bengal and Bombay coast districts, and somewhat earlier than usual in North-Western India. Temporary advances had occurred in the Arabian Sea as well as in the Bay during the last week of May, in the latter area giving rise to a cyclonic storm of great intensity. The permanent advance occurred during the second week of June. A small cyclonic storm appears to have formed in front of the advancing current in the Arabian Sea. The information available for tracing its history is very limited, and it is not possible to decide whether it ever passed beyond the initial stage of very squally weather and strong winds such as invariably occur during the advance of a strong monsoon current.

In the Bay of Bengal a well-marked cyclonic storm formed in front of the advancing mass of humid winds in the centre of the Bay. It crossed the coast of the Circars on the 15th and advanced by a curved path to the North-Western Provinces. It hence established humid winds and south-west monsoon conditions over Northern and Central India during the third week of the month. The following gives the dates on which the south-west humid current was fully established in different districts of Northern and Central India in 1893 :—

PROVINCE.	Date of commencement of south-west monsoon rains of 1893.
Burma	5th June.
Bengal	14th „
Bihar	14th „
North-Western Provinces.	18th „
Punjab	23rd „
Bombay	10th „
Central Provinces	17th „
Central India	18th „
Rajputana	22nd to 26th „

The most important feature of the south-west monsoon lower air currents in 1893 was their unusual strength. The following gives comparative data based upon the anemometric returns of four coast and four inland stations, where the exposure of the anemometer is most satisfactory and the data are believed to be most reliable :—

MONTH.	BAY OF BENGAL CURRENT.		BOMBAY CURRENT.	
	PERCENTAGE VARIATION OF MEAN AIR MOVEMENT FROM THE NORMAL AT		PERCENTAGE VARIATION OF MEAN AIR MOVEMENT FROM THE NORMAL AT	
	Four coast stations.	Four inland stations.	Four coast stations.	Four inland stations.
June	+16	+2	—13	+2
July	—6	+1	—24	—15
August	+4	+11	—9	+8
September	+28	+40	+7	+24
Mean of period	+11	+14	—10	+5

Corresponding data are given in the following tables showing the variation of the steadiness from the normal :—

MONTH.	BAY OF BENGAL CURRENT.		BOMBAY CURRENT.	
	VARIATION OF MEAN STEADINESS PERCENTAGE FROM THE NORMAL.		VARIATION OF MEAN STEADINESS PERCENTAGE FROM THE NORMAL.	
	Coast stations.	Inland stations.	Coast stations.	Inland stations.
June	—10	—7	—1	—8
July	+1	—5	—2	+4
August	—3	—12	+13	+8
September	+7	0	+14	+21
Mean of period	—1	—6	+6	+6

The more important and larger abnormal features of the air motion during the south-west monsoon period were :—

1st.—Winds were more southerly and less westerly than usual at Port Blair and in Lower Burma in June and July, and were more westerly than usual in August and September. The following gives data for two stations :—

STATION.	WIND DIRECTION, JUNE AND JULY.			WIND DIRECTION, AUGUST AND SEPTEMBER.		
	Actual.	Normal.	Westerly deflection.	Actual.	Normal.	Westerly deflection.
Port Blair	S 35° W	S 41° W	—6	S 70° W	S 43° W	+27
Diamond Island	S 37° W	S 37° W	0	S 62° W	S 42° W	+20

2nd.—Winds were during the greater part of the period more easterly than usual at the head of the Bay and in Bengal. The following gives data for four stations in illustration :—

STATION.	Month.	WIND DIRECTION.		
		Actual.	Normal.	Increased easting or decreased westing.
FALSE POINT	June	S 24° W	S 45° W	+21
	July	S 31° W	S 59° W	+28
	August	S 30° W	S 57° W	+27
	September	S 8° E	S 25° W	+33
SAUGOR ISLAND	June	S 20° W	S 15° W	—5
	July	S 23° W	S 24° W	+1
	August	S 4° W	S 17° W	+13
	September	S 27° E	S 4° W	+31
DACCA	June	S 19° E	S 16° E	+3
	July	S 1° W	S 19° E	—20
	August	S 14° E	S 14° E	0
	September	S 21° E	S 11° E	+10
BERHAMPORE	June	S 29° E	S 33° E	—4
	July	S 17° E	S 41° E	—24
	August	S 55° E	S 40° E	+15
	September	S 78° E	S 41° E	+37

The data show that the increased easting was very marked at False Point, where it was fairly uniform throughout the whole period. Winds were on the whole normal at Saugor Island in June and July, but were almost as largely deflected in August and September as at False Point.

3rd.—As the relative strength of the two currents was more constant than usual, winds were on the whole less unsteady than usual in the intermediate area or debatable ground of the two currents in Northern India. The following gives data for three typical stations in that area:—

STATION.	Month.	STEADINESS.		
		Actual.	Normal.	Variation from normal.
HAZARIBAGH	June . . .	% 30	% 19	+11
	July . . .	32	19	+13
	August . . .	19	7	+12
	September . . .	27	21	+6
ALLAHABAD	June . . .	30	12	+18
	July . . .	53	7	+46
	August . . .	18	4	+14
	September . . .	24	11	+13
AGRA	June . . .	18	28	-10
	July . . .	40	13	+27
	August . . .	8	10	-2
	September . . .	32	13	+19

4th.—Winds were slightly more southerly and less westerly than usual during the greater part of the period in Rajputana, Central India and the northern districts of the Central Provinces. The following gives data for three stations:—

STATION.	Month.	WIND DIRECTION.		
		Actual.	Normal.	Increased southing or decreased northing.
BOMBAY	June . . .	S 56° W	S 63° W	+7
	July . . .	S 74° W	S 75° W	+1
	August . . .	S 81° W	S 81° W	0
	September . . .	S 71° W	S 89° W	+18
JEYPORE	June . . .	S 83° W	N 60° W	+37
	July . . .	S 30° W	N 58° W	+92
	August . . .	S 78° W	N 58° W	+44
	September . . .	S 69° W	N 31° W	+80
AKOLA	June . . .	N 89° W	N 71° W	+18
	July . . .	N 77° W	N 74° W	+3
	August . . .	N 82° W	N 71° W	+11
	September . . .	N 72° W	N 66° W	+6

5th.—Winds were on the whole slightly less westerly

in the Deccan. The following gives data for three stations:—

STATION.	Month.	WIND DIRECTION.		
		Actual.	Normal.	Increased southing.
SECUNDERABAD	June . . .	S 88° W	S 80° W	+8
	July . . .	N 75° W	S 75° W	-30
	August . . .	N 78° W	S 87° W	-15
	September . . .	N 62° W	N 78° W	-16
BELLARY	June . . .	S 79° W	S 86° W	+7
	July . . .	N 86° W	S 88° W	-6
	August . . .	S 84° W	N 86° W	+10
	September . . .	N 87° W	N 78° W	-9
BELGAUM	June . . .	S 59° W	S 73° W	+14
	July . . .	S 66° W	S 70° W	+4
	August . . .	S 67° W	S 79° W	+12
	September . . .	S 72° W	N 84° W	+24

The preceding data indicate the chief features in the south-west monsoon circulation. They may be summed up as follows:—

- (1) The Bay of Bengal current was considerably stronger and steadier than usual.
- (2) It was directed to a less extent than usual in June and July towards Burma, and to a larger extent in August and September.
- (3) It was determined to a larger extent than usual up the Gangetic plain, where winds were much stronger and more steady from the east than usual.
- (4) The Bombay current was on the whole slightly stronger than usual.
- (5) In its extension over the peninsula it advanced slightly less directly from the west and more from the south than usual.
- (6) In its north-eastern extension it was determined more largely to Rajputana and the Punjab than usual, and hence the winds in these areas were steadier and more directly from south than usual.

IV. The Retreating south-west Monsoon Period.—The retreat of the south-west monsoon from North-Western India occurred under approximately normal conditions. During the first three weeks of September the whole of Northern India received more abundant rain than usual, partly as a result of the unusual strength and volume of the Bengal current and partly due to the precipitation accompanying three cyclonic storms. Immediately after the second of these storms, which broke up in the Punjab hills on the 20th, the easterly winds of the monsoon current withdrew from the Punjab and were succeeded by light unsteady winds for some time. Pressure increased rapidly in that area and the monsoon trough or belt of minimum pressure was turned round and stretched in a

northerly direction across the head of the Bay into Bengal. Increasing pressure in the eastern Himalayan hill and sub-montane tracts then caused it to be transferred slowly southwards and eastwards, so that in the second week of October it lay over Lower Burma, and the Andaman Sea, and the winds in this part of India were determined by its position. It was then transferred westwards across the Bay as a shallow diffused depression of squally weather and somewhat irregular lower air movement and began to affect the weather on the Madras coast from the 10th, when the easterly winds in the northern quadrant of the depression began to give heavy rain to the peninsula. This continued for a few days until the 18th. During the remainder of the month two storms of considerable intensity formed in the Bay. They advanced northwards, the first to Bengal and the second to Burma.

The chief features of the air movement in October were hence in full accordance with the unusual and prolonged determination of the Bay current (with one slight interruption) to the east of the Bay and Burma and North-East India. Among those were :—

- 1st.—Winds were on the average of the month more westerly than usual at Port Blair and less easterly in Burma.
- 2nd.—Winds were remarkably light and unsteady in the North-Western Provinces and the Punjab.
- 3rd.—They were below their normal strength in the north and centre of the peninsula.
- 4th.—They were weaker than usual on the Madras Coast and were, so far as can be judged from the returns of the stations, more easterly than usual.

After the two storms, which affected North-Eastern India and Burma in the last twelve days of October, pressure increased more rapidly than usual in that area and was more or less above the normal and in more or less considerable excess relative to the remainder of India. The low pressure trough or area during the month of November was transferred to the south-west of the Bay and there was hence a stronger and steadier influx of humid winds from the Bay to the Peninsula than usual. That inflow was interrupted by the formation of the cyclonic storm or disturbance in the south-west of the Bay, and by a cyclonic storm which formed in the Arabian Sea and advanced by a curved path into North-Western India. The winds in November were mainly determined by the high pressure conditions in Northern India, the large excess of pressure in North-Western India and Upper Burma, the continuance of a stronger humid current than usual in the south of the Bay, and the abnormal position of the low pressure area or trough in the south-west of the Bay further south than usual.

The following gives the chief features of the air motion in India in November :—

- 1st.—Winds were considerably stronger in the south and centre of the peninsula and at Port Blair.
- 2nd.—Winds were more easterly than usual at Port Blair and in the Deccan, Central Provinces and the Madras coast districts. The increased easting averaged about 20° and was hence large in amount.
- 3rd.—The increased easting was as largely shown in Bengal, where it was due to the high pressure conditions in Assam and Upper Burma.
- 4th.—Winds were remarkably light and unsteady in the Punjab and North-Western Provinces, where the mean air motion of the month was upwards of 30 per cent. below its normal strength.

During the month of December pressure was even more largely in excess in North-Eastern India and Upper Burma than in November, whilst it increased in the south-west of the Bay and Madras, and the pressure conditions obtaining during the month, were such as usually accompany the prevalence of ordinary north-east monsoon winds and conditions in the Bay. The following gives the chief features of the air motion which were directly related to these pressure conditions :—

- (1) Stronger and steadier northerly winds in the Irrawaddy Valley and stronger easterly winds than usual in Assam.
- (2) Stronger north-easterly winds than usual in the Madras coast districts and the Deccan. The easterly component in these winds was more strongly marked than usual.
- (3) Steady northerly winds in Bengal, with a much stronger easterly component than usual. The increased easting averaged about 25° .
- (4) Winds were, as in the previous month, remarkably light and unsteady in the North-Western Provinces and East Punjab.
- (5) Winds were more southerly and less westerly than usual in Rajputana and Central India.

The chief features of the air movement of the whole period were hence :—

- (1) Abnormally light and unsteady winds in the Gangetic plain and Punjab.
- (2) Stronger winds than usual in November and December in Bengal and Burma.
- (3) Stronger winds than usual in Madras and the Deccan in November and December, their average direction being more easterly and less northerly than usual.

(4) Early retreat of humid winds from the south of the Bay in the beginning of December and the prevalence of strong north-east monsoon

winds during the last three weeks of that month.

Humidity.

The four following monthly tables (Tables VI to IX) give variation data of aqueous pressure and relative humidity:—

1st.—For the nineteen meteorological areas adopted

in the geographical summaries of meteorological data in the annual Reports,
2nd.—For ten meteorological provinces.

TABLE VI.—Geographical Summary of the aqueous vapour pressure data of Table II in the Monthly Weather Reviews for the year 1893.

METEOROLOGICAL PROVINCE.	Number of Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
North-West Himalaya	6-7	-.002	-.009	-.014	+.026	+.066	+.046	+.013	-.033	+.037	+.004	-.006	+.014	+.012
Sikkim Himalaya and Nepal.	2-3	-.018	-.016	-.020	+.037	+.017	-.003	-.009	+.006	-.014	+.011	+.001	-.026	-.003
Punjab Plains . . .	4	+.025	-.013	-.019	+.095	+.118	+.070	+.052	-.074	+.050	-.023	+.001	+.008	+.024
Gangetic Plain . . .	8	+.015	+.012	+.001	+.053	+.064	+.039	-.015	-.013	+.004	+.023	+.043	+.023	+.021
Western Rajputana . .	3	+.018	+.008	-.044	+.022	+.067	+.013	+.046	+.014	+.011	+.005	+.027	+.036	+.019
Eastern Rajputana and Central India.	3-4	+.023	+.008	+.014	+.021	+.098	+.050	-.008	+.006	+.060	+.015	+.103	+.041	+.036
Nerbudda Valley . . .	3	+.019	-.017	+.045	+.015	+.091	+.028	-.009	+.016	+.011	-.033	+.146	+.019	+.028
Chota Nagpur . . .	1	+.017	+.058	+.034	+.070	+.102	+.052	-.033	-.027	-.020	+.033	+.057	+.043	+.032
Lower Bengal . . .	5	-.043	-.039	-.061	+.006	-.033	-.039	-.016	-.008	-.030	+.001	+.004	-.007	-.022
Assam and Cachar . .	2-3	-.016	-.007	-.041	+.002	+.031	-.018	-.025	+.011	-.009	+.021	+.005	-.050	-.008
Orissa . . .	2	-.046	-.010	-.060	-.016	-.025	-.023	-.005	-.007	-.010	-.015	+.012	-.011	-.018
Central Provinces South and Berar.	5	+.039	+.001	+.076	+.017	+.075	+.028	-.018	-.003	+.001	-.035	+.120	-.002	+.025
Konkan . . .	3	-.035	-.065	-.053	-.014	-.013	-.004	-.017	-.018	-.017	-.040	+.024	-.061	-.026
Malabar Coast . . .	1	-.006	+.047	-.009	-.018	-.009	+.002	-.021	+.007	-.006	-.008	+.001	-.072	-.008
Deccan, Hyderabad and Mysore.	5-6	-.003	+.043	+.045	+.012	+.048	+.016	+.002	-.002	-.017	-.022	+.058	-.020	+.013
East Coast and Carnatic.	4	-.027	+.021	-.011	-.040	-.018	-.002	+.017	-.023	-.038	-.004	+.049	-.027	-.009
Arakan and Pegu . . .	3-4	-.055	-.025	-.080	-.043	+.005	+.015	+.009	+.017	-.002	0	-.022	-.073	-.021
Bay Islands . . .	1	-.066	-.049	-.022	-.024	-.022	+.007	+.018	-.005	-.010	-.026	-.108	-.032	-.033
Extra Tropical India.	39-41	+.003	-.005	-.013	+.034	+.059	+.026	+.001	-.014	+.013	+.005	+.033	+.011	+.013
Tropical India.	24-26	-.015	0	-.003	-.012	+.018	+.009	-.001	-.005	-.013	-.019	+.040	-.035	-.003
Whole India . . .	65-66	-.004	-.003	-.009	+.016	+.043	+.019	0	-.010	+.002	-.004	+.036	-.007	+.007

TABLE VII.—Geographical Summary of the humidity data of Table II in the Monthly Weather Reviews for the year 1893.

METEOROLOGICAL PROVINCE.	Number of Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
North-West Himalaya	6-7	+4	+16	+8	+5	+8	+9	+5	-5	+9	+2	+2	+4	+6
Sikkim Himalaya and Nepal.	2-3	+8	+5	+5	+7	-1	+1	+2	+2	+2	+4	+1	-6	+2
Punjab Plains . . .	4	+12	+12	+4	+6	+8	+8	+10	-7	+8	-1	+1	+2	+5
Gangetic Plain . . .	8	+7	+14	+8	+6	+8	+9	+3	-2	+4	+4	+6	+2	+6
Western Rajputana . .	3	+5	+11	-1	+1	+5	+5	+7	0	+3	+3	+3	+2	+4
Eastern Rajputana and Central India.	3-4	+10	+12	+9	+2	+8	+11	+3	-3	+9	+5	+16	+7	+7
Nerbudda Valley . . .	3	+8	+3	+12	+2	+9	+8	-3	+3	+4	-2	+15	+5	+5

TABLE VII.—Geographical Summary of the humidity data of Table II in the Monthly Weather Reviews for the year 1893—continued.

METEOROLOGICAL PROVINCE.	Number of Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Chota Nagpur . . .	1	+ 6	+20	+12	+ 7	+18	+13	— 1	— 4	+ 2	+ 5	+ 7	+ 3	+ 7
Lower Bengal . . .	5	— 4	+ 6	+ 3	+ 2	+ 2	+ 1	0	— 2	0	0	0	— 2	+ 1
Assam and Cachar . . .	2—3	+ 1	+ 4	+ 2	+ 3	— 2	0	+ 2	+ 2	— 2	+ 2	— 2	— 3	+ 1
Orissa . . .	2	— 5	+ 1	+ 1	— 2	+ 3	+ 1	— 2	— 3	— 1	— 4	— 1	— 3	— 1
Central Provinces South and Berar.	5	+10	+ 4	+19	+ 2	+ 8	+ 6	— 4	+ 2	+ 3	— 2	+14	+ 1	+ 5
Konkan . . .	3	— 1	— 1	— 2	— 2	+ 2	+ 1	— 1	— 1	— 1	— 3	0	— 8	— 1
Malabar Coast . . .	1	— 4	+ 3	— 1	— 2	+ 2	— 2	— 1	— 4	— 2	— 2	— 1	— 9	— 2
Deccan, Hyderabad and Mysore . . .	5—6	+ 8	+12	+19	+ 4	+12	+ 4	0	+ 2	+ 1	+ 1	+ 9	+ 2	+ 6
East Coast and Carnatic.	4	— 3	+ 1	+ 2	+ 1	— 1	+ 2	+ 3	— 3	+ 2	— 2	+ 5	— 3	0
Arakan and Pegu . . .	3—4	— 4	— 2	— 2	— 1	+ 7	0	+ 1	— 1	— 2	+ 2	— 1	— 3	— 1
Bay Islands . . .	1	— 5	— 4	— 3	+ 1	+ 1	+ 1	+ 1	0	— 3	+ 2	— 7	— 8	— 2
Extra Tropical India	39—41	+ 7	+11	+ 6	+ 4	+ 6	+ 7	+ 3	— 2	+ 5	+ 2	+ 4	+ 2	+ 5
Tropical India . . .	25—26	+ 2	+ 4	+ 8	+ 1	+ 6	+ 3	0	0	+ 1	— 1	+ 5	— 2	+ 2
Whole India . . .	65—66	+ 5	+ 8	+ 7	+ 3	+ 6	+ 5	+ 2	— 1	+ 3	— 1	+ 4	0	+ 3

TABLE VIII.—Variations of the mean aqueous vapour pressure in 10 meteorological provinces of India in 1893.

METEOROLOGICAL PROVINCE.	MEAN VARIATION OF AQUEOUS VAPOUR PRESSURE FROM NORMAL IN												Year 1893.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Burma Coast and Bay Islands .	—'058	—'031	—'062	—'042	—'006	—'001	+ '014	+ '009	—'002	—'014	—'052	—'099	—'029
Assam	—'016	—'007	—'041	+ '002	+ '031	—'018	—'025	+ '012	—'009	+ '021	+ '005	—'050	—'008
Bengal and Orissa	—'044	—'031	—'065	—'004	—'024	—'022	—'011	—'004	—'023	+ '001	+ '006	—'006	—'019
Gangetic Plain and Chota Nagpur	—'005	+ '020	+ '006	+ '057	+ '053	+ '035	—'020	—'012	—'013	+ '034	+ '056	+ '027	+ '020
Upper Sub-Himalayas . . .	+ '031	+ '006	+ '001	+ '082	+ '128	+ '075	+ '014	—'049	+ '042	+ '005	+ '014	+ '025	+ '031
Indus Valley and North-West Rajputana	+ '037	—'004	—'038	+ '064	+ '087	+ '035	+ '070	—'025	+ '027	—'021	—'017	+ '013	+ '019
East Rajputana, Central India and Gujarat	+ '006	+ '002	—'013	+ '010	+ '076	+ '028	—'011	—'003	+ '045	—'004	+ '083	+ '030	+ '021
Deccan	+ '025	+ '014	+ '063	+ '020	+ '081	+ '037	—'007	+ '006	+ '002	—'024	+ '115	+ '002	+ '028
West Coast	—'028	—'037	—'042	—'015	—'012	—'002	—'018	—'012	—'015	—'032	+ '018	—'064	—'022
South India	—'017	—'031	—'005	—'054	—'015	+ '002	+ '014	—'014	—'029	+ '002	+ '052	—'014	—'009

TABLE IX.—Variations of the mean humidity from the normal in 10 meteorological provinces of India in 1893.

METEOROLOGICAL PROVINCE.	MEAN VARIATION OF HUMIDITY FROM NORMAL IN												Year 1893.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Burma Coast and Bay Islands .	—5	—3	—5	0	+6	—1	0	—1	0	+1	—4	—6	—2
Assam	+1	+4	+2	+3	—2	0	+2	+2	—2	+2	+2	—3	+1
Bengal and Orissa	—4	+4	+2	+1	+3	+1	0	—2	—1	—1	—1	—2	0
Gangetic Plain and Chota Nag- pur	+4	+15	+9	+6	+9	+10	+2	—2	+3	+4	+7	+3	+6
Upper Sub-Himalayas	+14	+16	+9	+10	+11	+12	+7	—5	+9	+3	+5	+5	+8
Indus Valley and North-West Rajputana	+12	+12	—1	+2	+5	+3	+8	—3	+3	—2	—4	—2	+3
East Rajputana, Central India and Gujarat	+7	+12	+6	+1	+7	+9	+5	—3	+8	+3	+13	+5	+6
Deccan	+9	+7	+13	+3	+9	+8	—2	+2	+3	0	+14	+3	+6
West Coast	—2	0	—2	—2	+2	+1	—1	—2	—2	—2	0	—8	—2
South India	—1	+5	+3	—2	+1	+2	+3	—1	—2	0	+6	—1	+1

The larger abnormal features of the humidity conditions were unusually persistent throughout the year. The following is a statement of the more important features. Data in illustration are given for the political divisions, as the preceding tables furnish corresponding data for the meteorological areas into which India is divided, and hence need not be repeated.

I. The Cold-weather Period.—The following were the chief features :—

1st.—The air was drier and contained less aqueous vapour than usual in Burma and North-Eastern India. The deficiency was almost as largely shown at Port Blair as at the land stations in Burma and North-Eastern India, thus indicating that over the east of the Bay, Burma and North-Eastern India land winds of unusual strength and dryness prevailed. The deficiency was on the whole greatest in Bengal, where the absolute humidity averaged nearly 10 per cent. below the normal amount.

PROVINCE OR AREA.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN			VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN		
	January 1893.	February 1893.	Cold weather period, 1893.	January 1893.	February 1893.	Cold weather period, 1893.
Port Blair (Andamans).	−066	−049	−058	−5	−4	−5
Burma . . .	−055	−024	−040	−4	−2	−3
Bengal . . .	−043	−039	−041	−4	+5	+1
Orissa . . .	−040	−010	−028	−5	+2	−2

2nd.—The amount of vapour in the air was more or less considerably in excess over the whole of North-Western and Central India, including Chota Nagpur, the North-Western Provinces, the Punjab, Sind, Central India, Berar and the Central Provinces. As temperature was considerably in defect in these areas, the double variation gave unusually high relative humidity, which element was hence very largely in excess.

PROVINCE.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN			VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN		
	January 1893.	February 1893.	Cold weather period, 1893.	January 1893.	February 1893.	Cold weather period, 1893.
Bihar . . .	−011	+001	−005	+1	+11	+6
Chota Nagpur .	+017	+058	+038	+6	+20	+13
North-Western Provinces.	+023	+016	+020	+9	+15	+12
Punjab . . .	+025	−013	+006	+12	+12	+12
Rajputana . .	−007	+004	−002	+6	+13	+10
Sind . . .	+057	+014	+036	+11	+17	+14
Central India .	+020	+008	+017	+9	+10	+10
Berar . . .	+063	+010	+037	+14	+9	+12
Central Provinces.	+026	−004	+011	+8	+4	+6

One of the more important meteorological features of this period was hence the excessive humidity in the Punjab, North-Western Provinces, Sind and Chota Nagpur, over nearly the whole of which the relative humidity was from 15 to 20 above the normal in February.

3rd.—Humidity was even more largely in excess at the hill stations in Northern and Central India, than in the adjacent plain districts. The increase in their case was due almost solely to the abnormally low day and night temperature at these stations, and not to any marked increase in the absolute humidity of the air. The following gives data for eight representative hill stations :—

STATION.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN			VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN		
	January 1893.	February 1893.	Cold weather period, 1893.	January 1893.	February 1893.	Cold weather period, 1893.
Quetta . . .	+014	+020	+017	+11	+32	+22
Leh . . .	−003	−004	−004	+11	+11	+11
Murree . . .	+017	+005	+011	+25	+25	+25
Simla . . .	−007	+007	0	+16	+31	+24
Ranikhet . .	+005	−008	−002	+16	+18	+17
Darjeeling .	−011	−020	−016	+9	+6	+8
Mount Abu .	−006	+023	+009	+4	+17	+11
Pachmarhi .	+018	+008	+013	+9	+10	+10

4th.—The air was slightly drier in the Bombay coast districts, as is almost invariably the case in colder and more severe cold weathers than usual. This was due to the abnormal extension of dry northerly winds along the west coast. The following gives data for the three observing stations in that area :—

STATION.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN			VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN		
	January 1893.	February 1893.	Cold weather period, 1893.	January 1893.	February 1893.	Cold weather period, 1893.
Bombay . . .	−052	−098	−075	−5	−4	−5
Ratnagiri . .	−033	−065	−049	0	0	0
Karwar . . .	−021	−031	−026	+2	0	+1

5th.—The air was damper in the Deccan and North Madras, and drier in the more southern districts of Madras. The variations were as a rule not large, and were also somewhat

irregular. The following gives data for five stations:—

STATION.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN			VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN		
	January 1893	February 1893.	Cold weather period, 1893.	January 1893.	February 1893.	Cold weather period, 1893.
Sholapur .	+ '009	+ '018	+ '014	+ 3	+ 4	+ 4
Madras .	+ '056	+ '078	+ '067	+ 7	+ 5	+ 6
Bangalore .	+ '018	+ '051	+ '035	+ 1	+ 6	+ 4
Trichinopoly .	- '057	- '031	- '044	- 9	- 5	- 7
Cochin .	- '006	+ '047	+ '021	- 4	+ 3	- 1

II. The Hot-weather Period.—The hygrometrical conditions during this period were even more abnormal than those of the cold weather period. The general meteorological conditions of the month of March were similar to those of February. There was unusually heavy rainfall due to a series of disturbances, and hence abnormally low temperature prevailed in that month over the whole of Northern and Central India and the North Deccan. The precipitation was most excessive in the Central Provinces. During the months of April and May, temperature conditions and the rainfall distribution were approximately normal in the interior and the hygrometric conditions were determined in part by the unusually abundant rainfall in February and March, and in part by the unusually early and frequent advance of humid currents from the Bay into Burma and from the Arabian Sea into Southern India during these months. The following gives a summary of the more important features of the humidity conditions during this period:—

1st.—The air was less humid than usual in Burma and Bengal. The deficiency was most marked in March and decreased in April, and was small in amount in May. The following gives data in illustration:—

PROVINCE.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN				VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN			
	March 1893.	April 1893.	May 1893.	Hot-weather period, 1893.	March 1893.	April 1893.	May 1893.	Hot-weather period, 1893.
Port Blair (Andamans).	- '022	- '024	- '022	- '023	- 3	+ 1	+ 1	0
Burma .	- '076	- '047	- '001	- '041	- 5	- 1	+ 8	+ 1
Bengal .	- '066	0	- '024	- '030	+ 2	+ 2	+ 3	+ 2
Orissa .	- '060	- '016	- '025	- '034	+ 1	- 2	+ 3	+ 1

2nd.—The absolute and relative humidity were more or less considerably above the normal during the period over the whole of North-Western and Central India and the Central Provinces.

PROVINCE.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN				VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN			
	March 1893.	April 1893.	May 1893.	Hot-weather period, 1893.	March 1893.	April 1893.	May 1893.	Hot-weather period, 1893.
Bihar .	- '021	+ '051	- '010	+ '007	+ 5	+ 5	+ 4	+ 5
Chota Nagpur .	+ '034	+ '070	+ '102	+ '009	+ 12	+ 7	+ 18	+ 12
North-Western Provinces.	+ '008	+ '053	+ '088	+ '050	+ 9	+ 8	+ 10	+ 9
Punjab .	- '019	+ 095	+ '118	+ '065	+ 4	+ 6	+ 8	+ 6
Sind .	- '044	+ '026	+ '097	+ '026	- 3	0	+ 6	+ 1
Rajputana .	- '016	+ 029	+ '050	+ '021	+ 4	+ 2	+ 6	+ 4
Central India .	+ '030	+ '005	+ '126	+ '054	+ 11	+ 2	+ 11	+ 8
Berar .	+ '105	+ '016	+ '077	+ '066	+ 22	+ 3	+ 10	+ 12
Central Provinces.	+ '049	+ '007	+ '085	+ '047	+ 14	+ 1	+ 8	+ 8

The most remarkable feature of this period was the excessive humidity in the Central Provinces, Berar and North Deccan in the month of March. The following gives data for five stations at which this feature was most strikingly exhibited:—

STATION.	ABSOLUTE HUMIDITY.			RELATIVE HUMIDITY.		
	Actual, March 1893.	Normal, March.	Variation from normal.	Actual, March 1893.	Normal, March.	Variation from normal.
Secunderabad .	553	448	+ '105	70	41	+ 29
Akola .	436	291	+ '145	53	28	+ 25
Nagpur .	431	337	+ '094	54	32	+ 22
Chanda .	537	?	?	71	?	?
Sambalpur .	569	?	?	74	?	?

3rd.—Humidity was as largely in excess at the hill stations in Northern and Central India as at the neighbouring plain stations. The following table gives data for eight stations:—

STATION.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN				VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN			
	March 1893.	April 1893.	May 1893.	Hot-weather period, 1893.	March 1893.	April 1893.	May 1893.	Hot-weather period, 1893.
Quetta .	+ '182	+ '166	+ '071	+ '140	+ 40	+ 22	+ 4	+ 22
Leh .	+ '009	+ '034	+ '001	+ '015	+ 15	+ 9	- 5	+ 6
Murree .	- '030	+ '009	+ '085	+ '021	+ 4	0	+ 10	+ 5
Simla .	- '030	- '009	+ '049	+ '003	+ 7	+ 2	+ 12	+ 7
Ranikhet .	+ '007	+ '069	+ '085	+ '054	+ 13	+ 9	+ 14	+ 12
Darjeeling .	- '026	+ '018	+ '011	+ '001	+ 4	+ 9	- 3	+ 3
Mount Abu .	+ '038	+ '031	+ '141	+ '070	+ 8	+ 1	+ 21	+ 10
Pachmarhi .	+ '037	+ '008	+ '078	+ '041	+ 15	0	+ 11	+ 9

III. The South-west Monsoon Period.—The rains commenced on the whole earlier than usual and extended rapidly into the interior. They prevailed with great steadiness throughout the period. The variations of the humidity conditions from the normal were hence not large, but were most marked in the drier districts of

North-Western and Central India, where the rainfall was more abundant than usual.

- (1) The mean humidity of the period was normal or slightly in defect in Burma and North-Eastern India.

PROVINCE.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN					VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN				
	June 1893.	July 1893.	August 1893.	September 1893.	South-west monsoon period, 1893.	June 1893.	July 1893.	August 1893.	September 1893.	South-west monsoon period, 1893.
Andamans	+	+	-	-	+	+	+	0	-3	0
Burma	-	+	+	+	+	-1	0	-1	+1	0
Bengal	-	-	-	-	-	+2	0	-2	-1	0
Assam	-	-	+	-	-	0	+2	+2	-2	+1
Orissa	-	-	-	-	-	+1	-2	-3	-1	-1

- (2) Humidity was more or less above the normal over nearly the whole of North-Western and Central India. The excess was very marked in June, when it was due to the unusually early advance of the monsoon currents, and also in September.

PROVINCE.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN					VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN				
	June 1893.	July 1893.	August 1893.	September 1893.	South-west monsoon period, 1893.	June 1893.	July 1893.	August 1893.	September 1893.	South-west monsoon period, 1893.
Bihar	-	-	-	-	-	+	+	-2	+1	+1
North-Western Provinces	+	-	-	+	+	+12	+3	-3	+5	+4
Punjab	+	+	-	+	+	+8	+10	-7	+9	+5
Sind	+	+	+	+	+	+4	+7	0	+1	+3
Rajputana	+	-	-	+	+	+7	+6	-4	+0	+5
Central India	+	-	+	+	+	+14	+1	0	+8	+6
Central Provinces	+	-	+	+	+	+9	-2	+2	+4	+3

- (3) It was also considerably in excess at the hill stations in these areas, as is shown by the following data for seven stations :—

STATION.	VARIATION OF MEAN ABSOLUTE HUMIDITY FROM NORMAL IN					VARIATION OF MEAN RELATIVE HUMIDITY FROM NORMAL IN				
	June 1893.	July 1893.	August 1893.	September 1893.	South-west monsoon period, 1893.	June 1893.	July 1893.	August 1893.	September 1893.	South-west monsoon period, 1893.
Leh	-	+	-	+	+	-5	+3	-8	+9	0
Murree	+	+	-	+	+	+20	+14	-10	+17	+10
Simla	+	-	-	+	-	+10	+4	-6	+8	+4
Chakrata	+	+	-	+	+	+13	+2	0	+6	+5
Ranikhet	+	-	-	+	+	+11	+1	+1	+2	+3
Mount Abu	+	-	+	+	+	+6	+7	+2	+14	+7
Pachmarhi	+	-	-	-	-	+7	3	1	+4	+2

IV. The Retreating South-west Monsoon Period.—The humidity conditions of India during this period were characterized by very large departures from the normal. During the month of October the retreating monsoon current was diverted more largely to Burma and North-Eastern India than usual, and hence the absolute and relative humidities were both above the normal to a moderate extent in these two areas during the month. It was chiefly determined to the peninsula during the month of November, and gave unusually heavy rain to nearly the whole of that area. In consequence of the unusually large influx of humid winds into that area, the period was one of great humidity and largely increased amount of cloud in the North Deccan, Central Provinces, Berar and Central India. In Burma the month was one of unusual dryness, due in part to the withdrawal of the monsoon currents, and in part to an increased flow of dry northerly winds from Upper Burma and the regions to the north. The south-west monsoon current retreated earlier than usual from Southern India and the Bay, and hence humidity was slightly below the normal during the greater part of the month of December in that area as well as in North-Eastern India. It was on the other hand above the normal in North-Western India.

The following gives a summary of the more important abnormal features of this element of observation during the period, October to December 1893, in India :—

- (1) Humidity was in slight excess in Burma, Assam and Bengal in October, and in moderate to large defect in November and December. These features are most fully shown by the variation data for the inland stations given below :—

STATION.	VARIATION OF THE MEAN ABSOLUTE HUMIDITY FROM THE NORMAL IN				VARIATION OF THE MEAN RELATIVE HUMIDITY FROM THE NORMAL IN			
	October 1893.	November 1893.	December 1893.	Period, October to December 1893.	October 1893.	November 1893.	December 1893.	Period, October to December 1893.
Port Blair	-	-	-	-	+	-7	-8	-4
Rangoon	-	-	-	-	-1	-6	-8	-5
Diamond Island	-	-	-	-	-1	-5	-9	-5
Sibsagar	+	+	-	-	+	+	-2	+1
Dhubri	?	-	-	-	?	+	-1	+2
Darjeeling	+	-	-	-	+	-1	-12	-4

- (2) Humidity was largely in excess in the Central Provinces, Berar, Deccan and Central India during nearly the whole period but more especially in the month of November. The following gives data of that month for repre-

sentative stations in the area of increased humidity :—

DISTRICT.	STATION.	ABSOLUTE HUMIDITY		RELATIVE HUMIDITY.	
		Actual, November 1893.	Variation from normal.	Actual, November 1893.	Variation from normal.
		"	"	%	
DECCAN .	Bellary .	.638	+ .093	75	+13
	Secunderabad .	.58c	+ .092	74	+12
	Poona .	.478	+ .055	58	+10
BERAR .	Akola .	.579	+ .179	69	+17
	Nagpur .	.548	+ .133	67	+14
CENTRAL PROV- INCES.	Saugor .	.453	+ .157	64	+21
	Khandwa .	.538	+ .179	65	+17
	Sutna .	.455	+ .157	67	+21
CENTRAL INDIA	Nowgong .	.446	+ .118	69	+17
	Deesa .	.393	+ .114	50	+16

The preceding data show that over the area defined by these stations the air contained on the average of the month from 25 to 40 per cent. more aqueous vapour than usual.

- (3) The air was throughout the whole of this period damper and contained more aqueous vapour than usual in North-Western India. The following gives variation data in illustration :—

PROVINCE.	VARIATION OF THE MEAN ABSOLUTE HUMIDITY FROM THE NORMAL IN				VARIATION OF THE MEAN RELATIVE HUMIDITY FROM THE NORMAL IN			
	October 1893.	November 1893	December 1893.	Period, October to December 1893.	October 1893.	November 1893.	December 1893.	Period, October to December 1893.
North-Western Provinces.	+ .023	+ .043	+ .023	+ .030	+4	+ 6	+ 2	+ 4
Punjab .	— .023	+ .001	+ .008	— .005	— 1	+ 1	+ 2	+ 1
Rajputana .	— .011	+ .064	+ .039	+ .031	+ 4	+ 10	+ 5	+ 6
Sind .	— .007	— .017	+ .036	+ .004	+ 1	— 4	— 1	— 1
Hill Stations, Upper India.	+ .004	— .000	+ .014	+ .004	+ 2	+ 2	+ 4	+ 3

The year.—The means given for the whole year in the final columns of Tables VIII and IX show that—

- (1) The absolute humidity was in slight defect in Burma, Assam, Bengal and Orissa, and the relative humidity normal or in slight defect.
- (2) Both the absolute and relative humidity was on the average of the year in excess over the whole area including Bihar, Chota Nagpur, the North-Western Provinces, the Punjab, Rajputana, Sind, Central India, the Central Provinces and Deccan. The mean absolute humidity was .025" in excess (the normal being .517"), and the relative humidity 6 in excess (the normal being 55).
- (3) The mean absolute humidity of the year was slightly below the normal in the west coast districts and Southern India, and the mean relative humidity was slightly in defect in the west coast districts.

These features, it should be noted, were remarkably persistent throughout the year. Thus in the Gangetic Plain and Chota Nagpur the mean relative humidity was above the normal in eleven out of twelve months, and in the west coast districts it was above the normal in only two months.

The following gives the mean annual variations of these two elements of observation for each year from 1875 to 1893 :—

Annual variation of pressure of vapour.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	
	—'004	—'017	+ '011	+ '020	—'014	—'004	+ '001	—'008	—'013	
	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.
	—'012	+ '001	+ '008	—'012	—'005	+ '003	—'003	—'007	—'002	+ '007
Annual variation of relative humidity.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	
	+1	—1	+1	0	—1	0	0	0	—1	
	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.
	0	0	+1	—1	—1	—1	—1	0	—1	+3

Cloud.

Variation data of this element of meteorological observation for the year 1893 are given in Tables X and XI. Table X gives mean variation data for the nineteen meteorological areas adopted in the geographical summaries

of meteorological data in the annual Reports previous to 1891 and Table XI gives similar data for the ten meteorological provinces of India.

TABLE X.—Geographical summary of the cloud data of Table II in the Monthly Weather Reviews for the year 1893.

METEOROLOGICAL PROVINCE.	Number of Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
North-West Himalaya	6—7	+0.9	+1.0	+0.1	—0.6	0	+0.7	+0.5	—0.8	+1.7	—0.1	—0.3	+1.1	+0.4
Sikkim, Himalaya and Nepal.	2—3	+1.4	+2.3	+1.7	+1.5	+0.3	+1.3	+1.5	+1.1	+1.4	+0.8	+1.9	—1.3	+1.2
Punjab Plains .	4	+1.1	+1.5	—0.1	+0.1	+0.1	+0.8	+1.2	—0.8	+1.4	—0.5	—0.3	+1.3	+0.5
Gangetic Plain .	9	+0.8	+2.5	+0.7	—0.1	+1.0	+1.3	+0.9	—0.3	+1.0	+0.4	+1.3	—0.1	+0.8

TABLE X.—Geographical summary of the cloud data of Table II in the Monthly Weather Reviews for the year 1893—concluded.

METEOROLOGICAL PROVINCE.	Number of stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Western Rajputana .	3	-1'0	+0'5	-1'0	-1'0	+0'4	+0'6	+0'1	-1'0	+1'1	-0'2	+0'8	+1'0	0
Eastern Rajputana and Central India.	4	+0'2	+1'1	+0'1	-0'3	+0'7	+1'6	+0'1	-0'7	+1'2	-0'3	+2'3	-0'1	+0'5
Nerbudda Valley .	3	+0'5	+0'3	+0'2	+0'1	+0'9	+0'7	-0'6	+0'5	+1'0	-0'1	+2'4	-0'5	+0'5
Chota Nagpur .	1	+2'0	+2'6	+1'5	+0'4	+2'2	+1'5	+0'9	+1'0	+1'0	+1'2	+2'2	-1'2	+1'3
Lower Bengal .	5	+0'8	+2'5	+1'7	+0'9	+1'8	+0'9	+0'9	+0'4	+0'7	+1'1	+1'2	-0'6	+1'0
Assam and Cachar .	4	+0'7	+1'6	+0'5	+0'7	-0'8	-0'1	+0'7	+0'1	-0'3	+0'4	+0'1	-1'8	+0'2
Orissa .	2	+0'5	+2'4	+1'6	+1'0	+2'0	+0'8	-0'4	+0'1	+0'3	+0'6	+1'0	-0'5	+0'8
Central Provinces South and Berar.	5-6	+0'8	+0'6	+1'4	+0'2	+1'0	+0'7	-0'8	+0'3	+0'8	-0'2	+2'2	-0'2	+0'6
Konkan .	3	-0'5	-0'5	-0'7	+1'6	+1'0	+0'5	+0'2	+0'8	+0'4	-0'6	+1'1	+0'8	+0'3
Malabar Coast .	1	-1'1	-1'7	-0'5	-0'3	-0'8	-3'3	-0'3	-2'0	-1'0	-1'2	+0'9	-2'1	-1'1
Deccan, Hyderabad and Mysore.	6	+0'2	+0'1	+0'8	+0'4	+1'1	+0'3	+0'2	+0'3	-0'1	-0'5	+1'5	-0'7	+0'3
East Coast and Carnatic.	4	-0'2	+1'3	+1'4	+0'1	+0'7	0	+0'7	+0'4	+0'7	+0'4	+2'0	-0'1	+0'6
Arakan and Pegu .	4	+0'2	-0'1	+0'8	+0'4	+1'8	+0'4	+0'9	+0'7	+0'8	+1'4	-1'0	-0'8	+0'5
Bay Islands .	1	+1'2	-0'3	+0'5	+1'3	+2'0	+2'2	+1'4	+1'8	+1'7	+2'3	+1'6	+0'2	+1'3
Extra Tropical India	41-43	+0'7	+1'5	+0'5	+0'1	+0'6	+0'9	+0'6	-0'2	+1'0	+0'1	+0'9	-0'1	+0'6
Tropical India .	26-27	+0'2	+0'4	+0'8	+0'5	+1'1	+0'3	+0'2	+0'4	+0'5	+0'1	+1'2	-0'4	+0'4
Whole India .	67-70	+0'5	+1'1	+0'6	+0'2	+0'8	+0'7	+0'4	0	+0'8	+0'1	+1'0	-0'2	+0'5

TABLE XI.—Variation of the mean cloud amount from the normal in 10 meteorological provinces of India in 1893.

METEOROLOGICAL PROVINCE.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year 1893.
Burma Coast and Bay Islands .	+0'5	-0'5	+0'5	+0'9	+1'8	+0'8	+0'9	+0'9	+1'2	+1'6	-0'4	-0'7	+0'6
Assam .	+0'9	+1'6	+0'7	+0'6	-0'6	-0'1	+0'5	+0'1	-0'6	+0'2	+0'1	-2'0	+0'1
Bengal and Orissa .	+0'8	+2'3	+1'7	+0'8	+1'9	+0'8	+0'6	+0'4	+0'5	+1'0	+1'0	-0'6	+0'9
Gangetic Plain and Chota Nagpur .	+0'8	+2'6	+0'9	+0'1	+1'4	+1'1	+0'9	+0'2	+1'0	+0'6	+1'6	-0'8	+0'9
Upper Sub-Himalayas .	+1'2	+2'0	+0'4	0	+0'4	+1'5	+0'9	-0'7	+1'4	+0'1	+0'4	+1'1	+0'7
Indus Valley and North-West Rajputana .	-0'1	+0'9	-0'9	-0'7	-0'1	+0'3	+0'6	-1'1	+0'8	-0'3	-0'3	+1'1	0
East Rajputana, Central India and Gujarat .	+0'2	+1'3	+0'1	-0'3	+1'1	+1'7	+0'4	-0'6	+1'3	-0'1	+2'2	+0'2	+0'6
Deccan .	+0'4	+0'3	+0'7	+0'2	+0'9	+0'8	-0'2	+0'5	+0'7	-0'2	+2'0	-0'5	+0'5
West Coast .	-0'4	-0'8	-0'7	+1'2	+0'6	-0'5	+0'1	+0'1	+0'1	-0'8	+1'1	+0'1	0
South India .	-0'1	+0'9	+1'5	-0'1	+0'7	+0'1	+0'7	+0'3	+0'4	+0'1	+1'7	-0'7	+0'5

The more important features in the cloud distribution are briefly summarized below. In the following tables average data are given for the political divisions in order to present the facts from a slightly different point of view to that in either of Tables X and XI.

I. The Cold-weather Period.—The cloud amount was normal or in slight excess in Burma and the centre and south of the Peninsula and the west coast districts. There was a much greater amount of cloud than usual in the area including Bengal, Bihar, Chota Nagpur, the North-Western Provinces, Punjab, Sind, Rajputana, Baluchistan, Central India, Berar and the Central Provinces.

The following table gives comparative data of the cloud amount for that area :—

PROVINCE.	MEAN CLOUD AMOUNT, COLD WEATHER PERIOD, 1893.		
	Actual.	Normal.	Variation from Normal.
Assam	4'7	3'4	+1'3
Bengal	3'4	1'8	+1'6
Bihar	3'4	2'0	+1'4
Chota Nagpur	4'5	2'2	+2'3
Orissa	3'5	2'0	+1'5
North-Western Provinces and Oudh .	4'6	2'9	+1'7
Punjab	5'0	3'7	+1'3
Rajputana	3'2	2'6	+0'6
Central India	3'0	2'6	+0'4
Central Provinces	2'4	1'7	+0'7

Skies were most serene during this period in the west coast districts and Arakan, in each of which areas the mean cloud amount was less than 1'0. The cloud proportion was so far as can be judged from the available data least at Akyab (0'3), Karwar (0'2), and Ratnagiri (0'4), at which

stations skies were practically free from cloud during the whole period.

II. The Hot-weather Period.—There was more cloud than usual in nearly every district of India during this period. The only important exceptions were Assam in the month of May, the west coast districts in March, and the Indus Valley during the whole period. The excess in the latter area was large in March and May. In the former month it was due to the abnormal prevalence of cold weather storms a month later than usual, and in May to earlier partial advances of humid currents from the neighbouring sea areas.

The following gives average comparative data for the period:—

PROVINCE.	MEAN CLOUD AMOUNT IN HOT WEATHER PERIOD, 1893.		
	Actual.	Normal.	Variation from normal.
Burma	4.6	3.7	+0.9
Bengal	5.2	3.8	+1.4
Assam	5.5	5.3	+0.2
Chota Nagpur	4.2	2.8	+1.4
Bihar	2.5	2.0	+0.5
North-Western Provinces and Oudh	2.5	1.9	+0.6
Punjab	2.9	2.9	0
Rajputana	2.4	2.1	+0.3
Central India	2.5	2.5	0
Central Provinces	2.9	2.3	+0.6
Bombay Coast	2.7	2.1	+0.6
Deccan	3.5	2.9	+0.6
Madras Coast	3.9	2.9	+1.0

III. The South-west Monsoon Period.—The mean monthly cloud amount was in steady excess throughout the whole of this period, the only important exception being Upper India in the month of August, where it was in slight defect. The excess was on the whole most marked in Chota Nagpur, Bihar and the North-Western Provinces, and was least in the west coast districts, Deccan, Assam and the Bengal coast districts. The following gives a summary of the data of the period for the larger political divisions:—

POLITICAL DIVISION OR PROVINCE.	MEAN CLOUD AMOUNT, SOUTH-WEST MONSOON PERIOD, 1893.		
	Actual.	Normal.	Variation from normal.
Burma	8.6	7.9	+0.7
Bengal	8.5	7.7	+0.8
Assam	7.7	7.7	0
Chota Nagpur	9.4	8.3	+1.1
Bihar	7.1	6.5	+0.6
North-Western Provinces and Oudh	6.4	5.6	+0.8
Punjab	3.5	2.8	+0.7
Rajputana	6.3	5.6	+0.7
Central India	7.1	6.4	+0.7
Central Provinces	7.6	6.9	+0.7
Bombay Coast	7.8	7.3	+0.5
Deccan	8.3	8.1	+0.2
Madras Coast	7.3	6.4	+0.9

IV. The retreating South-west Monsoon Period.—The variations in the amount of cloud were more pronounced in this period than in the preceding three periods, and varied almost directly with the distribution of

the rainfall of the period. Thus in October there was much more cloud than usual in North-Eastern India and Burma, and slightly less than usual in North-Western India and the Peninsula. In November when the retreating south-west monsoon current was chiefly directed to the Peninsula, and gave it unusually general and heavy rain, the amount of cloud was in general and large excess in the Peninsula, Bengal, and the North-Western Provinces, and was normal or in slight defect in Upper India and Burma. The rainfall in Southern India in December, due to that current, was unusually small, whilst the cold weather disturbances in Upper India began earlier than usual. Hence the cloud amount in December was in largish excess in North-Western India and below the normal in the Peninsula, North-Eastern India and Burma. The deficiency was very large in Upper Burma and Assam, where abnormally dry clear weather prevailed.

The following brief summary of the variation data illustrates these remarks:—

AREA.	VARIATION OF MEAN CLOUD AMOUNT FROM NORMAL IN			
	October 1893.	November 1893.	December 1893.	Whole period from October to December 1893.
North-Eastern India and Burma.	+0.9	+0.6	—1.0	+0.2
Peninsula	—0.3	+1.6	—0.4	+0.3
North-Western India	—0.1	+0.8	+0.8	+0.5

The Year.—One of the noteworthy features of the year was the excess of cloud over the whole of India during each of the four periods. The following gives a summary of the data:—

	VARIATION OF MEAN CLOUD AMOUNT FROM NORMAL IN				
	I Period.	II Period.	III Period.	IV Period.	Whole year.
Tropical India	+0.3	+0.8	+0.4	+0.3	+0.4
Extra Tropical India	+1.1	+0.4	+0.6	+0.3	+0.6
Whole India	+0.8	+0.5	+0.5	+0.3	+0.5

The preceding data show that the increased cloud amount was greatest in Northern or Extra Tropical India in the cold weather and south-west monsoon periods, and in Tropical India or the Peninsula during the hot weather period. On the mean of the whole year the excess was slightly greater in Northern India than in the Peninsula. The mean normal amount of cloud in India is 4.2, and in 1893 the cloud amount averaged 4.7 or 0.5 in excess of the normal amount. The following table gives the variation of the mean amount of cloud in the Indian area, year by year, from 1875 to 1893:—

YEAR.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	
Annual variation of cloud amount.	0	—0.2	+0.3	+0.1	—0.1	—0.1	—0.1	0	+0.2	
	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.
	—0.1	+0.2	+0.2	—0.1	—0.1	+0.1	+0.2	+0.1	+0.1	+0.5

Rainfall.

The rainfall data of India are now issued in a separate volume. The third volume, that of 1893, contains the rainfall data of 2,119 stations, which are classified under their respective administrative divisions according to the following scheme :—

PROVINCE.	Number of Stations.
Burma	106
Assam	96
Bengal, Bihar, Chota Nagpur and Orissa	308
North-Western Provinces and Oudh	272
Punjab	202
Bombay	280
Madras	342
Coorg	9
Central Provinces	65
Berar	44
Mysore	79
Baluchistan	54
Kashmir	9
Rajputana	121
Central India	54
Hyderabad (Deccan)	24
Travancore	39
Cochin	3
Pudukota	12

This volume hence contains the whole of the available information for the year 1893 of this important element of meteorological observation.

The information includes monthly statements of—

- (a) the actual rainfall day by day ;
- (b) the total of the month ;
- (c) the number of rainy days during the month ;
- (d) the average or normal rainfall of the month for all stations for which rainfall data for at least five years are available ;
- (e) the average or normal number of rainy days of the month for all stations for which rainfall data for five years or upwards are available ;

(f) the accumulated rainfall (up to the date of each statement) throughout each of the seasons into which the year is divided.

Symons's rain-gauges are now used at all rain-gauge stations, with the exception of those in Mysore. The hour of measuring rainfall is 8 A.M. throughout India, and the amounts registered give the rainfall of the previous 24 hours, and hence generally of the rainfall of the previous civil day.

The following tables give summaries of the rainfall data of the year. In the first two tables (Tables XII and XIII) the summaries are drawn up in the form that was used for many years in the Annual Reports issued by the Department. In the two succeeding tables, Tables XIV and XV, the actual average rainfall data are given for the 52 meteorological districts, into which the Empire is divided for the comparison of crops and rainfall, for the four periods into which the year may be divided. The four periods are as follows :—

1st.—From January 1st to February 28th, which forms the period of the cold weather rains of Upper India.

2nd.—From March 1st to May 31st, which includes the hot season, when rain occurs mainly in the coast districts and in Assam during thunderstorms.

3rd.—From June 1st to October 31st, which forms the period of the south-west monsoon rains proper.

4th.—From November 1st to December 31st, which includes the period of the so-called north-east monsoon rains of Southern India, more especially of the Coromandel coast districts.

TABLE XII.—Geographical Summary of Rainfall Anomalies in 1893.

METEOROLOGICAL DIVISION.	Area, square miles.	Number of Stations.	Normal rainfall.	Actual rainfall, 1893.	Mean excess or defect.	Total excess, square miles $\times 1$ inch.	Total defect, square miles $\times 1$ inch.
			Inches.	Inches.	Inches.		
I.—Punjab Plains	120,000	29	21.52	30.30	+ 8.78	1,053,600	...
II.—North-Western Provinces and Oudh	83,500	45	37.49	47.42	+ 9.93	829,155	...
III.—Rajputana	67,000	19	28.42	38.67	+ 10.25	686,750	...
IV.—Central India States	91,000	20	42.01	49.60	+ 7.59	690,690	...
V.—Bihar	30,000	15	45.01	53.94	+ 8.93	267,900	...
VI.—Western Bengal	38,000	10	49.39	70.85	+ 21.46	815,480	...
VII.—Lower Bengal	54,000	28	66.64	83.76	+ 17.12	924,480	...
VIII.—Assam and Cachar	61,000	16	96.39	100.73	+ 4.34	264,740	...
IX.—Orissa and Northern Circars	27,000	16	48.00	67.19	+ 19.19	518,130	...
X.—Central Provinces, South	61,000	18	51.38	58.56	+ 7.18	437,980	...
XI.—Berar and Khandesh	43,000	13	35.96	43.01	+ 7.05	303,150	...
XII.—Gujarat	54,500	12	33.03	42.15	+ 9.12	497,040	...

TABLE XII.—Geographical Summary of Rainfall Anomalies in 1893—concluded.

METEOROLOGICAL DIVISION.	Area, square miles.	Number of Stations.	Normal rainfall.	Actual rainfall, 1893.	Mean excess or defect.	Total excess, square miles, $\times 1$ inch.	Total defect, square miles, $\times 1$ inch.
			Inches.	Inches.	Inches.		
XIII.—Sind and Cutch	68,000	10	8'49	10'42	+ 1'93	131,240	...
XIV.—North-Deccan	48,000	13	30'54	35'01	+ 4'47	214,560	...
XV.—Konkan and Ghats	16,000	11	138'92	142'12	+ 3'20	51,200	...
XVI.—Malabar and Ghats	18,000	8	113'89	106'04	- 7'85	...	141,300
XVII.—Hyderabad	74,000	15	32'54	53'59	+ 21'05	1,557,700	...
XVIII.—Mysore and Bellary	58,000	18	29'52	33'20	+ 3'68	213,440	...
XIX.—Carnatic	72,000	38	36'06	43'31	+ 7'25	522,000	...
XX.—Arakan	11,000	7	148'04	163'48	+ 15'44	169,840	...
XXI.—Pegu	32,500	7	71'95	76'15	+ 4'20	136,500	...
XXII.—Tenasserim	10,500	4	172'38	175'44	+ 3'06	32,130	...
XXIII.—Upper Burma	?	13	38'73	44'18	+ 5'45	...	...

On the mean of the whole area represented in the above table there was an excess of 8'94 inches or, excluding the Burmese Peninsula, 9'07 inches.

TABLE XIII.—Geographical Summary of the distribution of rainfall in 1893, according to season.

METEOROLOGICAL DISTRICT.	JANUARY AND FEBRUARY.			MARCH TO MAY.			JUNE TO OCTOBER.			NOVEMBER AND DECEMBER.		
	Normal average.	Actual average, 1893.	Difference.	Normal average.	Actual average, 1893.	Difference.	Normal average.	Actual average, 1893.	Difference.	Normal average.	Actual average, 1893.	Difference.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
North-West Himalayas	6'17	12'23	+ 6'06	7'61	9'08	+ 1'47	40'53	54'24	+ 13'71	1'75	0'58	- 1'17
Punjab Plains	2'08	5'21	+ 3'13	2'54	3'56	+ 1'02	16'13	21'09	+ 4'96	0'77	0'45	- 0'32
North-Western Provinces and Oudh	1'41	3'41	+ 2'00	1'42	2'65	+ 1'23	35'25	41'93	+ 6'68	0'38	0'40	+ 0'02
Rajputana	0'46	1'28	+ 0'82	0'74	1'48	+ 0'74	21'51	28'00	+ 6'49	0'22	1'71	+ 1'49
Central India States	0'91	2'14	+ 1'23	0'78	3'16	+ 2'38	41'88	44'88	+ 3'00	0'67	1'82	+ 1'15
Bihar	1'17	2'82	+ 1'65	2'54	3'81	+ 1'27	40'47	48'05	+ 7'58	0'31	0'27	- 0'04
Western Bengal and Chota Nagpur	1'28	5'24	+ 3'96	3'48	7'29	+ 3'81	46'49	58'57	+ 12'08	0'72	0'22	- 0'50
Lower Bengal	1'41	4'43	+ 3'02	10'40	17'85	+ 7'45	53'63	60'49	+ 6'86	0'71	0'08	- 0'63
Eastern Himalayas	1'56	2'73	+ 1'17	18'12	16'13	- 1'99	111'11	112'34	+ 1'23	0'46	0'65	+ 0'19
Assam and Eastern Bengal	1'92	2'39	+ 0'47	26'16	24'01	- 2'15	87'78	73'14	- 14'64	1'28	0'27	- 1'01
Orissa and Northern Circars	0'68	2'85	+ 2'17	4'36	13'22	+ 8'86	43'73	48'07	+ 4'34	2'86	3'24	+ 0'38
Central Provinces, South	0'82	2'98	+ 2'16	1'80	5'47	+ 3'67	48'34	49'58	+ 1'24	0'93	1'81	+ 0'88
Berar and Khandesh	0'47	1'89	+ 1'42	0'99	6'15	+ 5'16	35'29	32'86	- 2'43	1'37	2'10	+ 0'73
Gujarat	0'20	0'43	+ 0'23	0'41	0'60	+ 0'19	31'21	39'47	+ 8'26	0'31	1'71	+ 1'40
Sind and Cutch	0'50	1'56	+ 1'06	0'50	0'37	- 0'13	7'88	9'25	+ 1'37	0'22	0'34	+ 0'12
North Deccan	0'20	0'01	- 0'19	3'13	7'26	+ 4'13	25'53	25'82	+ 0'29	1'69	1'92	+ 0'23
Konkan and Ghats	0'28	0'01	- 0'27	1'65	6'58	+ 4'93	140'16	128'90	- 11'26	1'12	1'64	+ 0'52
Malabar and Ghats	0'51	1'04	+ 0'53	11'09	14'58	+ 3'49	98'08	85'81	- 12'27	4'22	4'62	+ 0'40
Hyderabad	0'16	0'82	+ 0'66	1'91	6'50	+ 4'59	29'03	43'66	+ 14'63	1'74	2'16	+ 0'42
Ceded Districts and Mysore	0'25	0'41	+ 0'16	4'65	5'87	+ 1'22	21'51	23'17	+ 1'66	2'80	3'72	+ 0'92
Carnatic	0'98	0'65	- 0'33	4'15	5'07	+ 0'92	20'89	19'49	- 1'40	10'76	18'29	+ 7'53
Nilgiris*	1'42	6'32	+ 4'90	9'28	18'60	+ 9'32	25'42	30'76	+ 5'34	12'52	15'83	+ 3'31
Arakan	1'01	1'07	+ 0'06	15'09	39'24	+ 24'15	128'90	122'00	- 6'90	3'08	1'15	- 1'93
Pegu	0'24	0	- 0'24	7'96	15'56	+ 7'60	66'50	63'71	- 2'79	3'11	1'47	- 1'64
Tenasserim	0'93	0'91	- 0'02	20'91	36'44	+ 15'53	148'10	137'83	- 10'27	2'35	0'28	- 2'07
Upper Burma	0'40	0'16	- 0'24	5'49	7'16	+ 1'67	30'85	34'86	+ 4'01	1'29	0'72	- 0'57
Bay Islands	2'19	0'39	- 1'80	18'59	14'20	- 4'39	81'25	65'50	- 15'75	14'64	5'29	- 9'35
Mean	1'10	2'35	+ 1'25	6'88	10'81	+ 3'93	54'72	55'68	+ 0'96	2'68	2'69	+ 0'01

TABLE XIV.—Average rainfall data of the 52 Meteorological divisions in India for the four seasons of the year 1893 and for the whole year.

PROVINCE.	DIVISION.	JANUARY AND FEBRUARY.			MARCH TO MAY.			JUNE TO OCTOBER.			NOVEMBER AND DECEMBER.			WHOLE YEAR.		
		Average actual rainfall.	Average normal rainfall.	Variation of actual from normal.	Average actual rainfall.	Average normal rainfall.	Variation of actual from normal.	Average actual rainfall.	Average normal rainfall.	Variation of actual from normal.	Average actual rainfall.	Average normal rainfall.	Variation of actual from normal.	Average actual rainfall.	Average normal rainfall.	Variation of actual from normal.
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
BURMA.	Tenasserim	0'75	?	?	42'55	?	?	159'59	?	?	0'51	?	?	203'40	?	?
	Lower Burma	0	?	?	21'17	?	?	73'17	?	?	0'28	?	?	94'62	?	?
	Central do.	0'02	?	?	17'48	?	?	67'80	?	?	0'41	?	?	85'51	?	?
	Upper do.	0'41	?	?	8'34	?	?	36'10	?	?	0'71	?	?	45'50	?	?
	Arakan	0'05	?	?	37'57	?	?	152'63	?	?	1'01	?	?	191'26	?	?
BENGAL AND ASSAM.	Eastern Bengal	2'78	1'58	+1'20	25'76	16'25	+9'51	78'92	70'53	+8'39	0'10	1'48	-1'38	107'56	89'84	+17'72
	Assam (Surma)	3'61	1'97	+1'64	37'11	37'96	-0'85	108'06	85'31	+22'75	0'20	1'59	-1'39	148'98	126'83	+22'15
	Do. (Brahmaputra)	2'81	2'37	+0'44	20'83	23'77	-2'94	57'22	59'87	-2'65	0'65	0'06	-0'31	81'51	86'97	-5'46
	Deltaic Bengal	5'36	1'63	+3'73	19'24	10'57	+8'67	55'37	48'98	+6'39	0'08	0'62	-0'54	80'05	61'80	+18'25
	Central do.	4'58	1'00	+3'58	15'80	7'32	+8'48	53'95	48'41	+5'54	0'03	0'42	-0'39	74'36	57'15	+17'21
	North do.	1'97	1'13	+0'84	16'77	15'12	+1'65	95'42	82'81	+12'61	0'36	0'33	+0'03	14'52	99'39	+15'13
	Orissa	4'22	1'27	+2'95	26'58	6'23	+20'35	49'41	49'12	+0'29	0'21	1'89	-1'68	80'42	58'51	+21'91
	Chota Nagpur	5'21	1'28	+3'93	7'97	3'96	+4'01	55'23	46'20	+9'03	0'13	0'65	-0'52	68'54	52'09	+16'45
NORTH-WESTERN PROVINCES AND OUDH.	Bihar (South)	2'90	1'05	+1'85	3'49	2'42	+1'07	45'38	39'21	+6'17	0'22	0'44	-0'22	51'99	43'12	+8'87
	Do. (North)	2'37	1'05	+1'32	3'93	4'30	-0'37	56'09	45'61	+10'48	0'11	0'23	-0'12	62'50	51'19	+11'31
	North-Western Provinces (East)	2'24	0'98	+1'26	1'69	0'88	+0'81	48'21	35'95	+12'26	0'97	0'37	+0'60	53'11	38'18	+14'93
	Oudh (South)	2'33	0'95	+1'38	2'16	0'99	+1'17	45'41	33'72	+11'69	0'27	0'43	-0'16	50'17	36'09	+14'08
	Do. (North)	2'84	1'09	+1'75	4'31	1'55	+2'76	44'28	35'89	+8'39	0'06	0'42	-0'36	51'49	38'95	+12'54
	North-Western Provinces (Central)	2'01	0'79	+1'22	2'03	0'78	+1'25	36'72	31'89	+4'83	0'41	0'40	+0'01	41'17	33'86	+7'31
PUNJAB.	North-Western Provinces (West)	2'40	0'84	+1'56	1'54	0'89	+0'65	25'10	26'69	-1'59	0'59	0'38	+0'21	29'63	28'80	+0'83
	North-Western Provinces (Submontane)	6'25	2'57	+3'68	4'63	2'81	+1'82	52'16	41'79	+10'37	0'31	0'52	-0'21	63'35	47'69	+15'66
	Punjab (South)	3'46	1'01	+2'45	1'62	1'24	+0'38	16'33	11'25	+5'08	0'30	0'26	+0'04	21'71	13'76	+7'95
	Do. (Central)	3'88	1'22	+2'66	2'45	1'46	+0'99	21'39	17'95	+3'44	0'27	0'31	-0'04	27'99	20'94	+7'05
	Do. (Submontane)	7'87	2'87	+5'00	3'81	2'57	+1'24	32'61	24'76	+7'85	0'18	0'70	-0'52	44'47	30'90	+13'57
	Do. (Hill Districts)	12'91	7'61	+5'30	9'53	8'86	+0'67	47'76	45'71	+2'05	0'31	1'71	-1'40	70'51	63'89	+6'62
BOMBAY AND MALABAR COAST DISTRICTS (MADRAS).	Do. (North-West)	7'16	3'09	+4'07	4'83	4'02	+0'81	22'53	14'98	+7'55	1'36	1'07	+0'29	35'88	23'16	+12'72
	Do. (West)	2'17	1'04	+1'13	3'02	1'60	+1'42	6'87	6'08	+0'79	0'40	0'29	+0'11	12'46	9'01	+3'45
	Malabar	0'51	0'35	+0'16	14'32	9'88	+4'44	97'39	112'09	-14'70	5'58	4'81	+0'77	117'80	127'13	-9'33
	Madras (South Central)	0'94	0'25	+0'69	7'67	6'06	+1'61	18'08	18'12	+0'86	8'34	5'13	+3'21	35'93	20'56	+6'37
	Coorg	0'57	?	?	12'12	?	?	67'88	?	?	5'88	?	?	86'45	?	?
	Mysore	0'87	0'19	+0'68	7'51	4'79	+2'72	27'42	25'83	+1'59	2'99	3'18	-0'19	38'79	33'99	+4'80
CENTRAL PROVINCES AND BERAR.	Konkan	0'02	0'12	-0'10	6'74	2'08	+4'66	103'08	111'64	-8'56	1'29	1'26	+0'03	111'13	115'10	-3'97
	Bombay Deccan	0	0'10	-0'10	6'03	2'81	+3'22	31'19	31'58	-0'39	1'58	1'87	-0'29	38'80	36'36	+2'44
	Hyderabad (North)	0'44	0'16	+0'28	6'94	1'78	+5'16	45'37	31'54	+13'83	1'78	1'77	+0'01	54'53	35'25	+19'28
	Khandesh	0'51	0'14	+0'37	4'52	1'22	+3'30	30'23	30'03	+0'20	1'47	1'48	-0'01	36'73	32'87	+3'86
	Berar	2'54	0'59	+1'95	6'44	1'11	+5'33	30'54	37'21	-6'67	2'48	1'20	+1'28	42'00	40'11	+1'89
	Central Provinces (West)	3'10	0'77	+2'33	4'98	0'96	+4'02	37'05	42'04	-4'99	2'63	0'90	+1'73	47'76	44'67	+3'09
BOMBAY (NORTH).	Do. do. (Central)	3'05	0'78	+2'27	5'21	1'26	+3'95	54'80	48'92	+5'88	2'09	0'69	+1'40	65'15	51'65	+13'50
	Do. do. (East)	3'04	0'83	+2'21	3'20	1'91	+1'29	55'47	46'43	+9'04	0'79	0'77	+0'02	62'50	49'94	+12'56
	Gujarat	0'19	0'08	+0'11	0'47	0'31	+0'16	47'13	43'39	+3'74	1'44	0'23	+1'21	49'23	44'01	+5'22
RAJPUTANA AND CENTRAL INDIA.	Kathiawar	0'50	0'14	+0'36	0'46	0'37	+0'09	29'76	29'39	+0'37	2'02	0'26	+1'76	32'74	30'16	+2'58
	Sind	1'75	0'71	+1'04	0'36	0'60	-0'24	3'33	4'84	-1'51	0'20	0'18	+0'02	5'64	6'33	-0'69
	Central India (East)	1'82	0'68	+1'14	3'30	0'72	+2'58	40'88	42'34	-1'46	1'46	0'79	+0'67	47'46	44'53	+2'93
MADRAS.	Rajputana (East), Central India (West)	1'53	0'51	+1'02	1'46	0'81	+0'65	25'78	26'70	-0'92	1'65	0'27	+1'38	30'42	28'29	+2'13
	Rajputana (West)	0'85	0'36	+0'49	0'96	0'64	+0'32	21'32	10'75	+10'57	1'70	0'03	+1'67	24'83	11'78	+13'05
	East Coast (North)	1'74	0'40	+1'34	7'04	3'38	+3'66	38'67	32'69	+5'98	7'57	3'90	+3'67	55'02	40'37	+14'65
	Do. do. (a)	1'48	0'26	+1'22	11'06	4'88	+6'18	70'28	51'93	+18'35	2'83	3'14	-0'31	85'65	60'21	+25'44
	Hyderabad (South)	0'91	0'25	+0'66	6'98	2'11	+4'87	40'08	26'74	+13'34	2'65	1'57	+1'08	50'62	30'67	+19'95
	Madras (Central)	0'35	0'08	+0'27	3'96	2'48	+1'48	21'31	21'10	+0'21	4'24	2'73	+1'51	29'86	26'39	+3'47
	East Coast (Central)	0'33	0'67	-0'34	2'18	2'06	+0'12	16'10	20'52	-4'42	25'26	11'94	+13'32	43'87	35'19	+8'68
	Do. (South)	0'32	0'76	-0'44	4'71	4'19	+0'52	20'48	24'20	-3'72	21'63	13'94	+7'69	47'14	43'09	+4'05
	Madras (South)	1'60	1'19	+0'41	7'21	5'14	+2'07	10'77	12'29	-1'52	11'49	10'21	+1'28	31'07	28'83	+2'24

TABLE XV.—Average actual and normal number of rainy days in the 52 Meteorological divisions in India for the four seasons of the year 1893 and for the whole year.

PROVINCES.	DIVISION.	JANUARY AND FEBRUARY.			MARCH TO MAY.			JUNE TO OCTOBER.			NOVEMBER AND DECEMBER.			WHOLE YEAR.		
		Average actual number of rainy days.	Average normal number of rainy days.	Variation of actual from normal.	Average actual number of rainy days.	Average normal number of rainy days.	Variation of actual from normal.	Average actual number of rainy days.	Average normal number of rainy days.	Variation of actual from normal.	Average actual number of rainy days.	Average normal number of rainy days.	Variation of actual from normal.	Average actual number of rainy days.	Average normal number of rainy days.	Variation of actual from normal.
BURMA.	Tenasserim	1.2	?	?	36.0	?	?	112.5	?	?	0.8	?	?	150.5	?	?
	Lower Burma	0	?	?	25.5	?	?	98.2	?	?	0.5	?	?	124.2	?	?
	Central do.	0.2	?	?	21.0	?	?	84.6	?	?	0.5	?	?	106.3	?	?
	Upper do.	0.5	?	?	15.8	?	?	50.6	?	?	1.8	?	?	68.7	?	?
	Arakan	0.2	?	?	20.3	?	?	111.3	?	?	1.7	?	?	133.5	?	?
BENGAL AND ASSAM.	Eastern Bengal	5.9	2.9	+3.0	22.0	10.9	+2.1	79.5	74.8	+4.7	0.3	1.9	-1.6	107.7	99.5	+8.2
	Assam (Surma)	8.7	4.2	+4.5	32.1	37.7	-5.6	93.3	84.1	+9.2	0.5	2.1	-1.6	134.6	128.1	+6.8
	Do. (Brahmaputra)	9.0	6.6	+2.4	30.7	34.7	-4.0	69.2	67.6	+1.6	1.6	2.4	-0.8	110.5	111.3	-0.8
	Deltaic Bengal	7.9	2.7	+5.2	19.4	14.3	+5.1	66.9	63.1	+3.8	0.2	1.4	-1.2	94.4	81.5	+12.9
	Central do.	8.1	2.3	+5.8	16.2	10.9	+5.3	66.1	61.0	+5.1	0.2	1.0	-0.8	90.6	75.2	+15.4
	North do.	5.6	2.6	+3.0	22.4	17.8	+4.6	77.8	69.9	+7.9	0.9	0.8	+0.1	106.7	91.1	+15.6
	Orissa	6.6	2.2	+4.4	16.9	9.6	+7.3	60.3	59.5	+0.8	0.6	2.9	-2.3	84.4	74.2	+10.2
	Chota Nagpur	9.6	2.7	+6.9	13.9	6.9	+7.0	67.1	63.0	+4.1	0.5	1.4	-0.9	91.1	74.0	+17.1
	Bihar (South)	7.4	2.5	+4.9	6.7	4.1	+2.6	53.8	47.8	+6.0	0.6	0.8	-0.2	68.5	55.2	+13.3
	Do. (North)	6.4	2.4	+4.0	8.8	6.2	+2.6	56.3	49.2	+7.1	0.3	0.7	-0.4	71.8	58.5	+13.3
NORTH-WESTERN PROVINCES AND OUDH.	North-Western Provinces (East)	6.4	2.1	+4.3	3.7	2.1	+1.6	54.1	40.9	+13.2	1.9	0.6	+1.3	66.1	45.7	+20.4
	Oudh (South)	6.9	2.0	+4.9	4.8	2.1	+2.7	45.3	37.9	+7.4	1.0	0.7	+0.3	58.0	42.7	+15.3
	Do. (North)	7.2	2.1	+5.1	8.0	3.1	+4.9	45.3	38.1	+7.2	0.3	0.7	-0.4	60.8	44.0	+16.8
	North-Western Provinces (Central)	5.8	1.9	+3.9	4.6	1.9	+2.7	41.1	35.3	+5.8	1.6	0.5	+1.1	53.1	39.6	+13.5
	North-Western Provinces (West)	6.7	2.1	+4.6	3.9	2.5	+1.4	31.9	30.7	+1.2	1.5	0.6	+0.9	44.0	35.9	+8.1
	North-Western Provinces (Submontane)	11.3	4.0	+7.3	10.2	5.9	+4.3	51.2	39.6	+11.6	0.9	0.9	0	73.6	50.4	+23.2
PUNJAB.	Punjab (South)	9.3	2.2	+7.1	4.5	2.6	+1.9	18.2	14.0	+4.2	0.7	0.4	+0.3	32.7	19.2	+13.5
	Do. (Central)	9.7	2.7	+7.0	6.1	3.2	+2.9	26.1	19.4	+6.7	0.8	0.6	+0.2	42.7	25.9	+16.8
	Do. (Submontane)	13.0	4.8	+8.2	8.0	4.9	+3.1	28.5	24.1	+4.4	0.4	1.1	-0.7	49.9	34.9	+15.0
	Do. (Hill Districts)	11.2	8.7	+2.5	17.3	13.2	+4.1	51.0	46.0	+5.0	1.4	2.2	-0.8	80.9	70.1	+10.8
	Do. (North-West)	11.9	5.5	+6.4	11.2	6.9	+4.3	23.7	17.6	+6.1	1.1	1.3	-0.2	47.9	31.3	+16.6
	Do. (West)	5.4	2.4	+3.0	6.2	3.3	+2.9	9.1	8.2	+0.9	0.8	0.5	+0.3	21.5	14.4	+7.1
	Malabar	0.8	0.5	+0.3	16.9	12.4	+4.5	100.3	99.8	+0.5	7.8	7.0	+0.8	125.8	119.7	+6.1
BOMBAY AND MALABAR COAST DISTRICTS (MADRAS).	Madras (South Central)	1.7	0.5	+1.2	12.9	9.0	+3.9	30.0	27.8	+2.2	10.4	8.5	+1.9	55.0	45.8	+9.2
	Ccoorg	1.1	?	?	21.5	?	?	98.5	?	?	7.7	?	?	128.8	?	?
	Mysore	1.4	0.3	+1.1	13.0	8.1	+4.9	43.4	39.2	+4.2	6.2	4.9	+1.3	64.0	52.5	+11.5
	Konkan	0	0.2	-0.2	5.4	4.5	+0.9	94.1	94.3	-0.2	2.2	2.0	+0.2	101.7	101.0	+0.7
	Bombay Deccan	0	0.3	-0.3	9.9	5.7	+4.2	45.5	46.2	-0.7	3.1	3.1	0	58.5	55.3	+3.2
	Hyderabad (North)	1.2	?	?	12.5	?	?	53.6	?	?	4.1	?	?	71.4	?	?
	Khandesh	1.3	0.2	+1.1	6.7	2.0	+4.7	42.4	42.1	+0.3	2.7	2.2	+0.5	53.1	46.5	+6.6
CENTRAL PROVINCES AND BERAR.	Berar	4.9	?	?	10.6	?	?	47.2	?	?	4.5	?	?	67.2	?	?
	Central Provinces (West)	5.5	1.9	+3.6	9.2	2.0	+7.2	51.0	49.1	+1.9	3.9	1.2	+2.7	69.6	54.2	+15.4
	Do. (Central)	5.8	1.7	+4.1	8.3	2.7	+5.6	60.1	52.2	+7.9	4.1	1.1	+3.0	78.3	57.7	+20.6
	Do. (East)	6.3	1.6	+4.7	6.5	3.7	+2.8	61.5	48.6	+12.9	1.9	1.3	+0.6	76.2	55.2	+21.0
BOMBAY (NORTH).	Gujarat	0.8	0.2	+0.6	2.2	0.5	+1.7	49.1	48.0	+1.1	2.5	0.5	+2.0	54.6	49.2	+5.4
	Kathiawar	1.5	0.2	+1.3	0.6	0.6	0	32.7	28.1	+4.6	3.1	0.3	+2.8	37.9	29.2	+8.7
	Sind	5.4	?	?	1.0	?	?	4.9	?	?	0.5	?	?	11.8	?	?
RAJPUTANA AND CENTRAL INDIA.	Central India (East)	5.0	?	?	5.7	?	?	46.8	?	?	3.2	?	?	60.7	?	?
	Rajputana (East), Central India (West)	4.8	?	?	3.6	?	?	29.8	?	?	2.4	?	?	40.6	?	?
	Rajputana (West)	2.4	?	?	2.3	?	?	20.2	?	?	2.9	?	?	27.8	?	?
MADRAS.	East Coast (North)	2.8	0.7	+2.1	10.9	5.3	+5.6	51.8	43.2	+8.6	6.3	4.1	+2.2	71.8	53.3	+18.5
	Do. do. (a)	4.0	0.7	+3.3	20.5	10.7	+9.8	88.0	67.6	+20.4	4.5	5.3	-0.8	117.0	84.3	+32.7
	Hyderabad (South)	1.7	?	?	10.2	?	?	53.4	?	?	5.3	?	?	70.6	?	?
	Madras (Central)	0.9	0.2	+0.7	7.7	4.2	+3.5	33.9	30.8	+3.1	7.0	4.2	+2.8	49.5	39.4	+10.1
	East Coast (Central)	0.9	0.8	+0.1	3.9	2.5	+1.4	25.3	27.1	-1.8	15.5	10.5	+5.0	45.6	40.9	+4.7
	Do. (South)	0.9	1.0	-0.1	7.2	4.8	+2.4	29.1	31.6	-2.5	18.3	14.1	+4.2	55.5	51.5	+4.0
	Madras (South)	2.8	1.8	+1.0	12.0	7.5	+4.5	18.1	18.8	-0.7	14.0	13.2	+0.8	46.9	41.3	+5.6

The more important features of the distribution of rainfall during the year 1893 are given in the following paragraphs :—

(I) The Cold Weather Period.—The rainfall of this period was above the normal over nearly the whole of India, and was largely in excess over the whole of Northern and Central India. Four cold weather storms advanced eastwards across Northern India in January and four in February. Five of these storms were of considerable intensity, and gave unusually heavy rain in North Western India, and very heavy snow in the Western Himalayas. Snow fell down to lower elevations than has occurred for many years. Thus, it fell down to a height of 1,800 feet in the hills to the west of Dera Ismail Khan, and to 2,000 feet in the Kurram district. It fell to a depth of six inches at Haripur (elevation 1,800 feet) in the Hazara district, and to a depth of 3,000 feet in Kulu. The snow-fall of the month of January was one of the heaviest on record over the greater part of the Afghan and Punjab mountain areas. That of February was normal or slightly above the average. The following gives comparative data for several hill stations, illustrating the character of the precipitation :—

STATION.	JANUARY 1893.			FEBRUARY 1893.			Cold weather period variation.
	Actual rainfall.	Normal rainfall.	Variation from normal.	Actual rainfall.	Normal rainfall.	Variation from normal.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
Murree . . .	9.05	2.62	+ 6.43	5.52	2.59	+ 2.93	+ 9.36
Simla . . .	4.59	2.50	+ 2.09	8.55	2.27	+ 6.28	+ 8.37
Chakrata . .	6.15 ²	3.61	+ 2.54 ²	13.35	2.98	+ 10.37	+ 12.91 ²
Ranikhet . .	8.37	2.43	+ 5.94	6.62	1.47	+ 5.15	+ 11.09
Dalhousie . .	18.91	2.28	+ 16.63	23.61	3.52	+ 20.09	+ 36.72
Dharmasala .	12.35	4.77	+ 7.58	12.65	4.18	+ 8.47	+ 16.05
Kilba . . .	3.31	12.38	— 9.07	5.47	9.50	— 4.03	— 13.10
Kailang . . .	3.79	3.21	+ 0.58	1.86	2.95	— 1.09	— 0.51
Leh . . .	1.63	0.22	+ 1.41	0.11	0.23	— 0.12	+ 1.29

The average rainfall over the whole of India during the cold weather period was 2.35 inches or 1.25 inches more than the normal. The following gives comparative data for the areas in which the average excess was more than one inch :—

PROVINCE.	RAINFALL DURING PERIOD, JANUARY AND FEBRUARY.			
	Actual, 1893.	Normal.	Variation.	Ratio of actual to normal.
	Inches.	Inches.	Inches.	
Punjab . . .	5.21	2.08	+ 3.13	2.5
North-Western Provinces .	3.41	1.41	+ 2.00	2.4
Bihar . . .	2.82	1.17	+ 1.65	2.4
West Bengal and Chota Nagpur . . .	5.24	1.28	+ 3.96	4.1
Lower Bengal . . .	4.43	1.41	+ 3.02	3.1
Orissa . . .	2.85	0.68	+ 2.17	4.2
Central Provinces . . .	2.98	0.82	+ 2.16	3.6
Berar and Khandesh . . .	1.89	0.47	+ 1.42	4.0

The preceding data show that over the whole of Northern and Central India the rainfall of the season was very largely above the normal, and that the excess was greatest in North Eastern India, the Punjab and the Central Provinces. The rainfall was absolutely greatest in amount in Bengal and the Punjab, *i.e.*, at the extremities of the Indo-Gangetic plain.

The rainfall in Burma, the Carnatic and west coast districts is always small in amount in the months of January and February ; but was even less than usual in the cold weather period of 1893.

(II) The Hot Weather Period.—As already stated the conditions during the month of March in Northern and Central India were very remarkable.

Several disturbances and storms crossed Northern India, similar in character to those of the preceding two months, and the month was unusually cool and showery. The most noteworthy feature of the month was the frequent and heavy rain over a large part of the Central Provinces and Central India, which inflicted great injury upon the cold weather crops, more especially the wheat crop, in those areas. Comparative rainfall data for each of the districts in the Central Provinces and Berar for the month will be found on page 110 of the March Review.

The following gives data for the six districts in the Central Provinces and Berar, in which the rainfall was most excessive :—

PROVINCE.	STATION.	RAINFALL.			
		Actual, March 1893.	Normal, March.	Variation from normal.	Ratio of actual to normal.
		Inches.	Inches.	Inches.	
CENTRAL PROVINCES	Chanda . . .	11.70	0.57	+ 11.13	20.5
	Wardha . . .	5.92	0.27	+ 5.65	21.9
	Damoh . . .	1.47	0.14	+ 1.33	10.5
	Wun . . .	8.87	0.44	+ 8.43	20.2
BERAR . . .	Basim . . .	3.02	0.18	+ 2.84	16.8
	Amraoti . . .	4.08	0.32	+ 3.76	12.8

The rainfall was hence most excessive in the area, including the districts of Chanda and Wardha in the Central Provinces and the adjacent districts of Wun, Basim and Amraoti in Berar.

The following gives a summary of the rainfall data for the whole area of excessive rainfall in Central India and the Deccan during the month of March :—

METEOROLOGICAL DIVISION.	RAINFALL.			
	Actual, March 1893.	Normal, March.	Variation from normal.	Ratio of actual to normal.
	Inches.	Inches.	Inches.	
Berar . . .	4.16	0.35	+ 3.81	11.9
Central Provinces (West) .	2.94	0.28	+ 2.66	10.5
Do (Central) . . .	3.02	0.41	+ 2.61	9.6
Do (East) . . .	1.80	0.51	+ 1.29	3.5
Central India . . .	1.39	0.20	+ 1.19	7.0
Hyderabad . . .	4.95	0.32	+ 4.63	15.5

A brief analysis of the conditions of this abnormal rainfall is given in the concluding remarks, pages 575 576.

It may be noted that the rainfall was also very largely in excess over the whole of Madras. The rainfall occurred during the same period in the Madras Deccan districts as in the Central Provinces, *viz.*, during the first fortnight of the month, and in the Madras coast districts it occurred at irregular intervals during the whole month.

The following gives a comparative statement of this rainfall in Madras :—

METEOROLOGICAL DIVISION.	RAINFALL.			
	Actual, March 1893.	Normal, March.	Variation from normal.	Ratio of actual to normal.
	Inches.	Inches.	Inches.	
Madras East Coast (North)	2'57	0'53	+ 2'04	4'8
Do do (a)	6'75	1'01	+ 5'74	6'7
Madras (South Central)	1'97	0'54	+ 1'43	3'6
Madras (Central)	1'31	0'14	+ 1'17	9'4
East Coast (Central)	1'30	0'21	+ 1'09	6'2
East Coast (South)	2'08	0'38	+ 1'70	5'5
Madras (South)	4'45	1'08	+ 3'37	4'1

The rainfall of the month was in moderate defect in Assam and normal in the Punjab. It was in slight to moderate excess in the North-Western Provinces and Bengal.

During the remainder of the period the rainfall was chiefly determined by two cyclonic storms, which were initiated by comparatively feeble temporary advances of humid winds in the Bay of Bengal. The first of these formed in the Bay in the last week of April and advanced to Burma, to which it gave a brief but heavy general burst of rain. The second storm formed in the north of the Bay in the fourth week of May and advanced by a curved path through Orissa, South-West and Central Bengal to Cachar. It gave an excessive downpour of rain to Orissa, South Bengal and Cachar, of which details are given in the May Review.

A temporary advance occurred also in the west coast districts of Bombay during the fourth week of May, which gave those districts heavy rain earlier than usual from south-west monsoon humid winds.

The rainfall of the hot weather period was hence characterized by the following features :—

1st.—It was in slight to moderate excess in the Punjab, Rajputana, North-Western Provinces and Bihar,

chiefly due to heavier rainfall than usual in March. The following gives data :—

PROVINCE.	RAINFALL DURING PERIOD, MARCH TO MAY.			
	Actual, 1893.	Normal.	Variation from normal.	Ratio of actual to normal.
	Inches.	Inches.	Inches.	
Punjab	3'56	2'54	+ 1'02	1'4
North-Western Provinces	2'65	1'42	+ 1'23	1'9
Rajputana	1'48	0'74	+ 0'74	2'0
Bihar	3'81	2'54	+ 1'27	1'5

2nd.—It was very largely in excess in Central India, Berar, the Central Provinces and Hyderabad (Deccan), chiefly due to a prolonged and unseasonable burst of rain during the month of March. The following gives data :—

PROVINCE.	RAINFALL DURING PERIOD, MARCH TO MAY.			
	Actual, 1893.	Normal.	Variation from normal.	Ratio of actual to normal.
	Inches.	Inches.	Inches.	
Central India	3'30	0'72	+ 2'58	4'6
Berar	6'44	1'11	+ 5'33	5'8
Central Provinces	4'46	1'38	+ 3'08	3'2
Hyderabad	6'96	1'95	+ 5'01	3'6

3rd.—It was very considerably in excess in Burma, the Circars, Orissa and Bengal, and more especially in those districts which received heavy rain from the two cyclonic storms that formed in the Bay during the period. The following gives data :—

METEOROLOGICAL DIVISION.	RAINFALL DURING PERIOD, MARCH TO MAY.			
	Actual, 1893.	Normal.	Variation from normal.	Ratio of actual to normal.
	Inches.	Inches.	Inches.	
Orissa	26'58	6'23	+ 20'35	4'3
South Bengal	17'52	8'95	+ 8'57	2'0
Arakan	39'24	15'09	+ 24'15	2'6
Pegu	15'56	7'96	+ 7'60	2'0

4th.—The only areas in which the rainfall was below the normal were Assam and Sind, but in these the deficiency was very small and of no importance.

5th.—The average rainfall of the period for the whole of India was 10'81 inches, and was 57 per cent. above the normal average rainfall of the period.

(III) *The South-West Monsoon Period.*—The permanent advance of the humid monsoon current occurred a few days later than usual on the Bombay coast during the second week of June. Almost simultaneously, the permanent and large advance of the current from the Bay into Bengal and Northern India accompanied the progress of a cyclonic storm of considerable intensity. The Bengal current was throughout nearly the whole period unusually strong and steady. It was slightly feebler than usual in August. The Bombay current was somewhat feebler than the normal in July and August, but it was on the whole steadier.

The following gives rainfall data for the Bombay Presidency (excluding Sind, Gujarat and Kathiawar), Hyderabad, the Central Provinces, Central India, Rajputana and Madras, which receive their rainfall during this period chiefly or entirely from the Bombay current.—

PROVINCE.	VARIATION OF MEAN ACTUAL RAINFALL FROM NORMAL EXPRESSED AS A PERCENTAGE.				
	June 1893.	July 1893.	August 1893.	September 1893.	Period, June to September 1893.
Bombay	+30	-33	-3	-19	-8
Hyderabad . . .	+52	+16	+65	+42	+43
Central Provinces .	+30	-33	+27	+26	+5
Central India . .	+67	-49	-13	+64	-2
Rajputana	+83	+19	-29	+158	+27
Madras	+12	+45	-12	+21	+16

The following gives the percentage variation of the mean actual rainfall, month by month, during this period in Burma, Bengal, Assam, the North-Western Provinces and the South-East Punjab, which form the area that receives its monsoon rainfall chiefly from the Bengal current:—

DIVISION.	VARIATION OF MEAN ACTUAL RAINFALL FROM NORMAL EXPRESSED AS A PERCENTAGE.				
	June 1893.	July 1893.	August 1893.	September 1893.	Mean of period.
Burma	-13	-20	+5	+33	-8
Bengal	+29	+22	-10	+9	+13
Assam	-2	+51	+23	-31	+12
North-Western Prov- inces and Oudh . .	+84	+9	-31	+67	+17
South-East Punjab .	+65	+35	-56	+83	+21

Judging from the approximate variations of the rainfall in the areas for which data are given in the two tables above, the Bombay current was of normal strength or slightly stronger than usual, and the Bay current considerably stronger and steadier than usual. There was no prolonged break at any time during this period due to the partial or complete retreat of the currents from North-Western India.

The estimation of the character of the monsoon currents, as judged by the strength of the winds and the variation of the rainfall from the normal, hence agree very approximately.

The preceding data show that when the Bengal current fell off in strength during the month of August and gave less rain than usual to Northern India, it was directed more largely to Assam and Burma than during the two preceding months, and, similarly, when the Arabian Sea current was weak and the rainfall in North-Western India was below the average in July and August, the Deccan and Southern India received increased rainfall. Hence during the south-west monsoon proper of 1893 the rainfall in Burma and in the Gangetic Plain were to some extent inversely related and also the rainfall in North-Western and Central India and in Southern India. The changes in the extension of the monsoon currents and the distribution of the accompanying rainfall were hence, more or less, compensatory.

The following gives the dates of the commencement of the monsoon rains proper in the various provinces of Northern and Central India:—

PROVINCE OR AREA.	Date of commencement of south-west monsoon rains in 1893.
Bengal	14th June.
Assam	17th ditto.
Bihar and Chota-Nagpur . .	14th ditto.
North-Western Provinces . .	18th ditto.
Punjab	23rd ditto.
Bombay Coast	10th ditto.
Berar and Bombay Deccan . .	15th and 16th ditto.
Central Provinces	17th ditto.
Central India	18th ditto.
Rajputana	22nd to 26th ditto.

The following gives a brief summary of the more important features of the distribution of the rainfall during each month of the period:—

June.—As already pointed out, the monsoon currents were established in the coast districts during the second week of the month and advanced more rapidly than usual over Central and North-Western India. The only large area in which the rainfall of the month was in defect was Burma and the Assam Valley. The following gives data for that area:—

DIVISION.	RAINFALL.		
	Actual, June 1893.	Variation from normal.	Percentage variation.
	Inches.	Inches.	
Tenasserim	30.02	-9.92	-25
Lower Burma	12.77	-6.29	-33
Central Burma	10.43	-6.87	-40
Assam (Brahmaputra)	11.37	-4.47	-30

The rainfall of the month was hence approximately 33 per cent. below the normal of the month in that area.

The rainfall was in general excess over the whole of India, with one or two local exceptions of no importance. The following gives a summary of the provincial data :—

DIVISION.	RAINFALL.		
	Actual, June 1893.	Variation from normal.	Percentage variation.
	Inches.	Inches.	
Bengal	20'46	+4'60	+ 29
North-Western Provinces	7'78	+3'56	+ 84
Punjab	3'46	+1'78	+106
Rajputana	4'22	+1'91	+ 83
Central India	10'03	+4'01	+ 67
Central Provinces	10'36	+2'38	+ 30
Bombay	23'77	+4'80	+ 25
Madras	3'97	+0'41	+ 12

The most remarkable downpour of the month occurred in Kathiawar, Gujarat and South-West Rajputana between the 19th and 22nd.

The following gives the most noteworthy rainfalls in 24 hours during this period :—

Date.	DIVISION.	STATION.	Rainfall in 24 hours pre- ceding 8 A.M. of date.
			Inches.
19th	Kathiawar	Junagad	13'51
20th	Ditto	Dhoraji	13'36
21st	Gujarat	Bardoli	14'24
22nd	Ditto	Broach	11'19
	Ditto	Jambusar	10'24

It may be noted that this area is very liable to heavy downpours when the Bombay current is blowing strongly and is directed more northerly than usual. The following table gives mean data for that area of excessive rainfall in June :—

PROVINCE.	RAINFALL.			
	Actual, June 1893.	Normal, June.	Variation from normal.	Ratio of actual to normal.
	Inches.	Inches.	Inches.	
Gujarat	18'84	6'26	+12'58	3'0
Kathiawar	12'88	3'26	+ 9'62	4'0
Oodeypore	13'82	3'49	+10'33	4'0
Pertabgarh	18'58	4'59	+13'99	4'0
Jodhpur	4'08	1'55	+ 2'53	2'6

July.—The Bay current held steadily during the first three weeks of the month, during which the whole of Northern India received daily rain. The current fell off to some extent during the last week of the month, when occasional showers only were received in the Punjab and North-Western Provinces, and light rain in Bengal from the 23rd to the 29th. The rainfall of the month was

hence in excess over nearly the whole area depending for its rainfall on the Bay current, except Burma, Orissa and Deltaic Bengal.

The following gives data for these areas of deficient rainfall during the month :—

DIVISION.	RAINFALL.			
	Actual, July 1893.	Normal, July.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Tenasserim	37'81	47'26	— 9'45	— 20
Lower Burma	19'14	23'06	— 3'92	— 17
Central Burma	16'54	20'16	— 3'62	— 18
Arakan	37'36	48'32	—10'96	— 23
Orissa	8'37	12'50	— 4'13	— 33
Deltaic Bengal	10'59	12'05	— 1'46	— 12

The deficiency was hence moderate in amount in Burma and small in Deltaic Bengal.

The following gives comparative data for Northern India :—

DIVISION.	RAINFALL.			
	Actual, July 1893.	Normal, July.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Burma	27'71	34'70	—6'99	— 20
Assam	26'18	17'32	+ 8'86	+ 51
Bengal	18'68	15'37	+ 3'31	+ 22
Orissa	8'37	12'50	— 4'13	— 33
Chota-Nagpur	14'25	13'16	+ 1'09	+ 8
Bihar	16'45	12'03	+ 4'42	+ 37
North-Western Provinces	12'73	11'72	+ 1'01	+ 9
Punjab	9'82	7'44	+ 2'38	+ 32

The chief features of the rainfall of the month in Northern India were—

- (1) Moderately large deficiency in Orissa, due mainly to the unusual absence of cyclonic storms in the Bay, and hence to the great steadiness of the monsoon currents in Northern India.
- (2) Very large excess in the Punjab, the excess being most marked in the eastern and northern districts, more especially Lahore, Gujranwala, Sialkot, Gujrat, Jhelum, Rawalpindi, Hazara and Bannu.
- (3) Large excess in East Bengal and Assam (Surma), more especially in the Cachar District and the Garo Hills. Thus Cherrapunji received a total of 187'91 inches during the month, 86'42 inches of which fell on five days.
- (4) Moderately large excess in Bihar and North Bengal.

The Bombay current, as judged by the strength of the winds at the coast stations and the amount of the precipitation in the districts to which it usually gives rain, was below its normal strength. There was a partial break in the rains in Rajputana, Central India, and the Central Provinces during the last ten days of the month. As usually occurs when the current is weaker than usual in the northern and central districts of its extension, Madras and the Deccan received larger amounts than usual.

The following gives an analysis of the rainfall data of the areas dependent for their rain at this period on the Bombay current :—

DIVISION.	RAINFALL.			
	Actual, July 1893.	Normal, July.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Sind	1'50	1'86	— 0'36	— 20
Gujarat and Kathiawar .	10'13	14'87	— 4'74	— 32
Central India (East) .	7'77	15'32	— 7'55	— 49
Rajputana (East) and Central India (West).	8'90	9'77	— 0'87	— 9
Rajputana (West) . . .	6'70	3'33	+ 3'37	+ 101
Bombay Deccan and Khandesh.	4'84	8'48	— 3'64	— 43
Konkan and Malabar	25'73	37'23	— 11'50	— 31
Madras East Coast (North)	9'18	6'77	+ 2'41	+ 36
Do. (South)	2'33	1'05	+ 1'28	+ 122
Do. (Central)	5'06	3'17	+ 1'89	+ 60

August.—Both branches of the monsoon current were, judging from the rainfall, below their normal volume and strength. Two short breaks occurred during the month, but, with these exceptions, the rains held steadily. The showers were however lighter than usual, and there were very few heavy cyclonic or torrential downpours in any part of India. The month was on the whole one of light to moderate rain. The rainfall in Northern India was, as might be expected, most largely in defect in the most interior districts, *i.e.*, in the Punjab and North-Western Provinces. It was, on the other hand, in slight excess in Burma and Assam, and hence the Bengal current was during the month diverted more largely to the eastwards in the north of the Bay than it had been in June and July.

The following gives comparative data showing the distribution of the rainfall in Burma and Northern India during the month.

PROVINCE.	RAINFALL.			
	Actual, August 1893.	Normal, August.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Burma	28'41	27'05	+ 1'36	+ 5
Assam	21'23	17'30	+ 3'93	+ 23
Bengal	13'40	14'90	— 1'50	— 10
Orissa	10'30	11'41	— 1'11	— 10
Chota-Nagpur	10'09	13'56	— 3'47	— 26
Bihar	8'62	11'38	— 2'76	— 24
North-Western Provinces.	7'26	10'58	— 3'32	— 31
Punjab	2'19	4'95	— 2'76	— 56

These figures illustrate very clearly the distribution of the rainfall due to the Bay current in August.

They show that the rainfall was in slight to moderate excess in Burma and the eastern districts of Northern India, in slight to moderate defect in the central districts, and in large defect in the western districts. These facts are evidently explained by the weakness of the current and its larger diversion than usual to the eastward in the north and east of the Bay.

The Bombay current was also below its normal strength, but not to so large an extent as in July over the greater part of the area, and more especially in the Bombay Presidency, the Central Provinces and Central India; the number of rainy days was normal or in slight excess, but the daily falls and showers were, as a rule, not heavy. Hence the rainfall of the month was in moderate defect in the northern districts of the distributing area of the Bombay current, including Rajputana, Sind and Kathiawar, normal or in slight excess in the central districts, including the Bombay Deccan, Khandesh, Konkan, Gujarat, Berar, Central Provinces and Hyderabad; and in moderate defect in the southern districts, including the whole of Central and Southern Madras and Mysore.

The following table gives comparative data for the areas depending on the Bombay current :—

DIVISION.	RAINFALL.			
	Actual, August 1893.	Normal, August.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Sind	0'01	1'94	— 1'93	— 99
Gujarat and Kathiawar .	6'05	7'78	— 1'73	— 22
Central India (East) .	10'94	12'64	— 1'70	— 13
Rajputana (East) and Central India (West).	6'28	9'68	— 3'40	— 35
Rajputana (West) . . .	3'72	4'48	— 0'76	— 17
Bombay Deccan and Khandesh.	7'48	6'04	+ 1'44	+ 24
Konkan and Malabar . .	19'63	22'05	— 2'42	— 11
Madras (North)	7'40	7'13	+ 0'27	+ 4
Do. (South)	0'75	1'97	— 1'22	— 62
Do. (Central)	2'98	4'35	— 1'37	— 31

September.—The monsoon currents on the whole blew more strongly and gave heavier rainfall than usual. The distribution of the rainfall was very largely influenced by the

three cyclonic storms which occurred during the month. The first storm advanced west-north-westwards from Orissa to the South-East Punjab, and gave very heavy rain to the North-Western Provinces and the Punjab during the latter part of its existence. The second storm of the month crossed the North Orissa Coast on the 11th and advanced along an almost straight track to South-West Rajputana, where it recurved; passed through Central Rajputana and the South-East Punjab and broke up in the Punjab hill districts. It was remarkable for the excessively heavy rain it gave to the greater part of Central India, Rajputana and the East Punjab. The downpour was exceptionally heavy in South-West Rajputana. The following gives the most noteworthy examples :—

STATE.	STATION.	RAINFALL IN 24 HOURS PRECEDING 8 A.M. OF DATE.						
		14th.	15th.	16th.	17th.	18th.	19th.	Total 14th to 19th September 1893.
		Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
SIROHEE	Mount Abu	0'03	8'17	15'51	9'20	9'20	4'18	46'29
JODHPUR	Sachor	0'30	16'35	20'15	1'87	0'10	...	38'77
	Jaswantpura	0'68	10'50	7'25	3'25	0'76	...	22'44

The higher elevations of the Western Himalayas received a moderate fall of snow whilst this storm was breaking up.

The third and last storm of the month formed in the north-west of the Bay, but advanced along a northerly track into Bihar and gave a moderately heavy burst of rain to the whole of North-Eastern India. The northern districts of Bihar and Bengal received a heavy downpour on the 26th, when the storm was breaking up, falls of 10 to 15 inches being recorded at several stations.

The following gives a summary of the chief features of the rainfall distribution of the month :—

1st.—Rainfall was in slight to large excess in Burma, and in slight to moderate defect in Assam and East Bengal.

2nd.—It was in moderate excess in Bengal and in large excess in Bihar, Chota-Nagpur, the North-Western Provinces, the Punjab, Rajputana and Central India. The following gives data :—

DISTRICT.	RAINFALL.			
	Actual, September 1893.	Normal, September.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Bengal	12'90	11'86	+1'04	+ 9
Bihar	11'82	8'40	+3'42	+ 41
Chota-Nagpur	13'83	8'71	+5'12	+ 59
North-Western Provinces and Oudh	10'67	6'39	+4'28	+ 67
Punjab	5'90	2'50	+3'40	+136
Rajputana	6'45	2'50	+3'95	+158
Central India	10'98	6'69	+4'29	+ 64

The excess in these districts was in great measure due to the unusually heavy rainfall which they received from the cyclonic storms of the month.

The excess was exceptionally large in the following districts :—

PROVINCE.	DISTRICT.	RAINFALL.			
		Actual, September 1893.	Normal, September.	Variation from normal.	Percentage variation.
		Inches.	Inches.	Inches.	
PUNJAB	Umballa	13'29	4'82	+ 8'47	+176
	Jallundur	15'17	3'85	+11'32	+204
	Hoshiarpur	15'86	4'25	+11'61	+273
	Gurdaspur	14'69	4'43	+10'26	+232
	Sialkot	9'25	2'64	+ 6'61	+250
RAJPUTANA	Jodhpur	7'47	1'47	+ 6'00	+408
	Sirohee	22'68	4'23	+18'45	+436
	Oodeypore	13'30	5'16	+ 8'14	+158
CENTRAL INDIA	Rewah	16'68	6'43	+10'25	+159
NORTH-WEST- ERN PROVINCES	Rae Bareli	18'34	7'13	+11'21	+157
	Mirzapur	17'84	6'97	+10'87	+156

3rd.—The rainfall of the month was in defect in those districts dependent chiefly upon the Bombay current, and which did not receive cyclonic rainfall from the first two storms of the month. It was hence in slight to moderate defect in Bombay, including Kathiawar, Gujarat, Khandesh, Berar, the western districts of the Central Provinces, and the greater part of Madras, Mysore, Coorg and Southern India generally. The deficiency was nowhere large or important. The following gives data :—

DIVISION.	RAINFALL.			
	Actual, September 1893.	Normal, September.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Berar	4'01	6'89	—2'88	—42
Central Provinces (West)	6'41	8'60	—2'39	—27
Kathiawar	6'24	7'83	—1'59	—20
Gujarat	6'12	8'03	—1'91	—24
Khandesh	3'77	7'07	—3'30	—47
Bombay Deccan	3'75	5'44	—1'69	—31
Konkan	13'14	14'07	—1'83	—12
Mysore	3'38	4'84	—1'46	—30
Madras	3'66	4'61	—0'95	—21

The following gives a brief statement of the chief features of the rainfall distribution of the whole south-west monsoon period :—

1st.—The rainfall of the period was in slight defect in Arakan and Lower Burma, and in slight excess in Upper Burma. The rainfall was generally in moderate deficiency during the first two months, and in slight excess during the last two months.

2nd.—The total rainfall of the period was in slight to moderate excess in Bengal and in Cachar, and was normal in Assam and Orissa. It was also in moderate excess in Bihar and Chota-Nagpur. The following gives data :—

DIVISION.	RAINFALL DURING PERIOD, JUNE TO OCTOBER.			NUMBER OF RAINY DAYS DURING PERIOD, JUNE TO OCTOBER.		
	Actual, 1893.	Normal.	Variation from normal.	Actual, 1893.	Normal.	Variation from normal.
	Inches.	Inches.	Inches.			
Bengal	70.92	62.68	+ 8.24	72.6	67.2	+ 5.4
Assam (Surma)	108.06	85.31	+ 22.75	93.3	84.1	+ 9.2
Do. (Brahmaputra) . .	57.22	59.87	— 2.65	69.2	67.6	+ 1.6
Bihar	50.74	42.41	+ 8.33	55.1	48.5	+ 6.6
Chota-Nagpur	55.23	46.20	+ 9.03	67.1	63.0	+ 4.1
Orissa	49.41	49.12	+ 0.29	60.3	59.5	+ 0.8

3rd.—The rainfall of the period was considerably in excess over nearly the whole of the North-Western Provinces, Rajputana, Central India and the Punjab. The excess was, as shown by the number of rainy days, due to more frequent as well as to heavier rain than usual.

DIVISION.	RAINFALL DURING PERIOD, JUNE TO OCTOBER.			NUMBER OF RAINY DAYS DURING PERIOD, JUNE TO OCTOBER.		
	Actual, 1893.	Normal.	Variation from normal.	Actual, 1893.	Normal.	Variation from normal.
	Inches.	Inches.	Inches.			
North-Western Provinces (East)	48.21	35.95	+ 12.26	54.1	40.9	+ 13.2
Oudh (South)	45.41	33.72	+ 11.69	45.3	37.9	+ 7.4
Do. (North)	44.28	35.89	+ 8.39	45.3	38.1	+ 7.2
North-Western Provinces (Central)	36.72	31.89	+ 4.83	41.1	35.3	+ 5.8
Do. (West)	25.10	26.69	— 1.59	31.9	30.7	+ 1.2
Do. (Submontane)	52.16	41.79	+ 10.37	51.2	39.6	+ 11.6
Punjab (South)	16.33	11.25	+ 5.08	18.2	14.0	+ 4.2
Do. (Central)	21.39	17.95	+ 3.44	26.1	19.4	+ 6.7
Do. (Submontane)	32.61	24.76	+ 7.85	28.5	24.1	+ 4.4
Do. (Hill Districts)	47.76	45.71	+ 2.05	51.0	46.0	+ 5.0
Do. (North-West)	22.53	14.98	+ 7.55	23.7	17.6	+ 6.1
Do. (West)	6.87	6.08	+ 0.79	9.1	8.2	+ 0.9

4th.—The rainfall was in slight to moderate defect in the west coast districts, excepting Kathiawar and Gujarat, where it was normal or in slight excess.

DIVISION.	RAINFALL DURING PERIOD, JUNE TO OCTOBER.			NUMBER OF RAINY DAYS DURING PERIOD, JUNE TO OCTOBER.		
	Actual, 1893.	Normal.	Variation from normal.	Actual, 1893.	Normal.	Variation from normal.
	Inches.	Inches.	Inches.			
Sind	3.33	4.84	— 1.51	4.9	?	?
Konkan	103.08	111.64	— 8.56	94.1	94.3	— 0.2
Malabar	97.39	112.09	— 14.70	100.3	99.8	+ 0.5

It was normal or in slight defect in the West Deccan districts and Khandesh.

DIVISION.	RAINFALL DURING PERIOD, JUNE TO OCTOBER.			NUMBER OF RAINY DAYS DURING PERIOD, JUNE TO OCTOBER.		
	Actual, 1893.	Normal.	Variation from normal.	Actual, 1893.	Normal.	Variation from normal.
	Inches.	Inches.	Inches.			
Bombay Deccan	31.19	31.58	— 0.39	45.5	46.2	— 0.7
Khandesh	30.23	30.03	+ 0.20	42.4	42.1	+ 0.3
Berar	30.54	37.21	— 6.67	47.2	?	?
Central Provinces (West)	37.05	42.04	— 4.99	51.0	49.1	+ 1.9

5th.—It was in moderate excess in the central and eastern districts of the Central Provinces and the northern coast districts of Madras, and in large excess in Hyderabad, as is shown by the following data :—

DIVISION.	RAINFALL DURING PERIOD, JUNE TO OCTOBER.			NUMBER OF RAINY DAYS DURING PERIOD, JUNE TO OCTOBER.		
	Actual, 1893.	Normal.	Variation from normal.	Actual, 1893.	Normal.	Variation from normal.
	Inches.	Inches.	Inches.			
Central Provinces (Central)	54.80	48.92	+ 5.88	60.1	52.2	+ 7.9
Central Provinces (East)	55.47	46.43	+ 9.04	61.5	48.6	+ 12.9
Hyderabad (North)	45.37	31.54	+ 13.83	53.6	?	?
Do. (South)	40.08	26.74	+ 13.34	53.4	?	?
Madras East Coast (North)	38.67	32.69	+ 5.98	51.8	43.2	+ 8.6

6th.—It was normal in amount or in slight defect in Southern India, except the central districts of Madras and Mysore.

DIVISION.	RAINFALL DURING PERIOD, JUNE TO OCTOBER.			NUMBER OF RAINY DAYS DURING PERIOD, JUNE TO OCTOBER.		
	Actual, 1893.	Normal.	Variation from normal.	Actual, 1893.	Normal.	Variation from normal.
	Inches.	Inches.	Inches.			
Madras (Central)	21.31	21.10	+ 0.21	33.9	30.8	+ 3.1
Do. East Coast (Central)	16.10	20.52	— 4.42	25.3	27.1	— 1.8
East Coast (South)	20.48	24.20	— 3.72	20.1	31.6	— 2.5
Madras (South)	10.77	12.29	— 1.52	18.1	18.8	— 0.7
Do. (South-Central)	18.98	18.12	+ 0.86	30.0	27.8	+ 2.2
Mysore	27.42	25.83	+ 1.59	43.4	39.2	+ 4.2

(IV) *The Retreating South-west Monsoon Period.*—The rainfall of this period was characterized by several interesting features. The rains ceased in Upper India during the fourth week of September, and pressure increased rapidly in North-Western India. The Bay current was determined for a short period to North-Eastern India and Burma, which received light to moderate general rain from the 1st to the 10th and 11th October. A very shallow

depression, the representative at this period of the trough of low pressure which forms a marked and important feature of the pressure distribution of the rains, lay over the north-east of the Bay. As a result either of the pressure changes accompanying this rainfall or of the general rapid increase of Pressure in Central Asia and the Eastern Himalayan area this shallow depression was for some days transferred slowly southwards, and on the 8th covered the east of the Bay. It then marched westwards, and the humid current in its northern and eastern quadrants gave heavy general rain to the greater part of the Peninsula on the 10th and following days. This formed the commencement of the so-called north-east monsoon rains of 1893 in the Madras Presidency. The distribution of the subsequent rainfall in October and November was largely determined by a succession of depressions and cyclonic storms. The depression which initiated the retreating south-west monsoon rains in Madras concentrated in the Deccan area on the 16th and then advanced northwards through the Central Provinces into the North-Western Provinces, where it broke up. The whole disturbance gave heavy rain to the centre and north of the Peninsula and the Gangetic Plain.

Two cyclonic storms visited the Bay area during the last twelve days of October. The first advanced by a curved path to the mouth of the Megna and East Bengal, to which it gave a moderately heavy burst of rain, and the second marched across the Arakan coast into Central Burma. It gave a moderate burst of rain to the whole of Burma. Madras received moderate general rain during the short interval between these two storms.

In consequence of the peculiar tracks of the storms and depressions of October, Southern India received less rainfall than usual, whilst the whole of Central India, the Gangetic Plain, North-Eastern India and Burma, and the greater part of the Deccan and Mysore, obtained more than the average for the period, due to the abnormal diversion of the humid currents from Madras to those areas. The following gives data illustrating the contrast:—

	DISTRICT.	RAINFALL.			
		Actual, October 1893.	Normal, October.	Variation from normal.	Percentage variation.
AREA OF DEFICIENT RAINFALL.	Madras	5'97	6'78	-0'81	-12
	Hyderabad	5'14	2'90	+2'24	+77
	Bombay Deccan	6'58	5'02	+1'56	+31
	Central Provinces	2'92	1'97	+0'95	+48
AREA OF INCREASED RAINFALL.	Berar	3'14	2'56	+0'58	+23
	North-Western Provinces	3'53	1'41	+2'12	+150
	Bihar	4'43	3'36	+1'07	+32
	Chota-Nagpur	4'20	2'97	+1'23	+41
	Orissa	6'20	6'16	+0'04	+1
	Bengal	5'49	4'72	+0'77	+16
	Burma	9'06	8'97	+0'09	+1

The distribution of the rainfall of November was equally abnormal. A small cyclonic storm which crossed the Madras coast between Madras and Cuddalore during the first week of the month gave very heavy rain to the greater part of the central coast and interior districts. A very shallow depression which formed off the South Coromandel Coast on the 12th and disappeared on the 14th, accompanied a remarkably heavy downpour in the Circars coast districts on the 12th and 13th. The most noteworthy downpours during these two disturbances are tabulated on pages 462 and 463 of the November Review. Another important feature of the influx of humid winds accompanying these disturbances was that they extended over the whole of the Deccan and Central Provinces, and gave abnormal and unseasonable rain in the north of the Peninsula.

A cyclonic storm formed in the south-east of the Arabian Sea, which travelled by a curved path to Kathiawar and South-West Rajputana. Its dispersion was followed by cloudy showery weather in Rajputana, Central India, the Central Provinces, and North-Western Provinces. During this period, from the 15th to the 22nd, little rain fell in Madras, but on the 22nd squally weather set in over the south-west of the Bay, which initiated a diffused disturbance. It gave a heavy burst of rain to the southern districts of Madras until the 28th.

The chief features of the rainfall of the month were:—

- 1st.—Heavier rainfall than usual in Madras generally. It was most excessive in the coast districts from the Circars to Tanjore.
- 2nd.—Heavier rainfall than usual in the North Deccan, Berar, the Central Provinces, Central India, Rajputana and the North-Western Provinces. The actual amount of the excess was not large, but relatively to the normal of the period it was very large.
- 3rd.—The rainfall was less than the small normal amount of the period in North-Eastern India and Burma.

The coast districts of Madras south of Nellore received occasional showers during the month of December, due chiefly to intensified north-east monsoon winds. The rainfall of the month was very small over the whole of Southern India, with the exception of a narrow strip along the coast between Cuddalore and Negapatam.

Cold weather disturbances of somewhat unusual character gave a brief period of heavy rain on the 30th and 31st of the month in North-Western India, which very considerably exceeded the normal fall of the month in these districts.

The following gives a summary of the chief features of the rainfall distribution of the period.

1st.—The rainfall was largely in excess in Madras, chiefly due to the excessive rainfall in the month of November. The following gives data :—

PROVINCE.	DIVISION.	RAINFALL DURING NOVEMBER AND DECEMBER.			
		Actual, 1893.	Normal.	Variation from normal.	Percentage variation.
		Inches.	Inches.	Inches.	
MADRAS	East Coast (North)	7.57	3.90	+ 3.67	+ 94
	Madras (Central)	4.24	2.73	+ 1.51	+ 55
	East Coast (Central)	25.26	11.94	+ 13.32	+ 112
	Do. (South)	21.53	13.94	+ 7.69	+ 55
	Madras (South)	8.34	5.13	+ 3.21	+ 63
	Malabar	5.88	4.81	+ 0.77	+ 16
	Madras (South)	11.49	10.21	+ 1.28	+ 13

The rainfall was most excessive in the East Coast (Central) districts, and more especially in the following for which data are given :—

DISTRICT.	RAINFALL DURING NOVEMBER AND DECEMBER.			
	Actual, 1893.	Normal.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Kistna	8.67	3.67	+ 5.00	+ 136
Godavary	16.42	3.98	+ 12.44	+ 313
Nellore	25.26	11.94	+ 13.32	+ 112
Trichinopoly	15.22	8.22	+ 7.00	+ 85
Tanjore	28.23	18.44	+ 9.79	+ 53
Coimbatore	9.31	4.95	+ 4.36	+ 88

The rainfall was normal in Mysore.

2nd.—The rainfall was in large excess (relative to the normal) in Hyderabad, Berar, the Central Provinces, Central India, and Rajputana, and in the eastern and central districts of the North-Western Provinces. The following gives data :—

DIVISION.	RAINFALL DURING NOVEMBER AND DECEMBER.			
	Actual, 1893.	Normal.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Hyderabad (North)	1.78	1.77	+ 0.01	+ 1
Do. (South)	2.65	1.57	+ 1.08	+ 69
Berar	2.48	1.20	+ 1.28	+ 107
Central Provinces (West)	2.63	0.90	+ 1.73	+ 192
Do. (Central)	2.09	0.69	+ 1.40	+ 203
Gujarat	1.44	0.23	+ 1.21	+ 526
Kathiawar	2.02	0.26	+ 1.76	+ 677
Rajputana	1.68	0.15	+ 1.53	+ 1020
Central India (East)	1.46	0.79	+ 0.67	+ 85
North-Western Provinces (East)	0.97	0.37	+ 0.60	+ 162

The abnormal character of the rainfall is very clearly indicated by the percentage variations, which show that from three to eleven times the normal fall of the period was received over a large part of this area, including Gujarat, Kathiawar, Rajputana and the central districts of the Central Provinces.

3rd.—The rainfall of the period was practically normal in amount and character in Bombay, Khandesh and the Bombay Deccan.

4th.—It was in moderate defect in North Eastern India and Burma. The following gives a summary of the data :—

PROVINCE.	RAINFALL DURING NOVEMBER AND DECEMBER.			
	Actual, 1893.	Normal.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Burma	1.85	2.79	- 0.94	- 34
Assam	0.43	1.28	- 0.85	- 66
Bengal	0.14	0.71	- 0.57	- 80
Orissa	0.21	1.89	- 1.68	- 89
Bihar	0.17	0.34	- 0.17	- 50
Chota-Nagpur	0.13	0.65	- 0.52	- 80

The Year.—The most remarkable feature of the year was that the rainfall was on the average of the whole of India in excess during each of the four seasons. The following gives means :—

MONTH.	RAINFALL.			
	Actual, 1893.	Normal.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
January and February	2.35	1.10	+ 1.25	+ 114
March to May	10.81	6.88	+ 3.93	+ 57
June to October	55.68	54.72	+ 0.96	+ 2
November and December	2.69	2.68	+ 0.01	0
YEAR	71.53	65.38	+ 6.15	+ 9

In this statement the results are the arithmetical averages of the rainfall data of stations situated in every part of India. Table XII shows that when the areas represented by these stations are taken into account the excess in India (excluding Burma) was 9.07 inches or 22 per cent. of the normal of the year.

The following gives a statement of average and variation rainfall data for the past 30 years:—

YEAR.	Actual average.	Variation from normal.	YEAR.	Actual average.	Variation from normal.
	Inches.	Inches.		Inches.	Inches.
1864 . . .	35'57	-5'52	1879 . . .	42'78	+1'69
1865 . . .	40'32	-0'77	1880 . . .	39'53	-1'56
1866 . . .	39'00	-2'09	1881 . . .	41'19	+0'10
1867 . . .	43'86	+2'77	1882 . . .	43'73	+2'64
1868 . . .	34'46	-6'63	1883 . . .	40'97	-0'12
1869 . . .	41'49	+0'40	1884 . . .	42'82	+1'73
1870 . . .	42'58	+1'49	1885 . . .	42'14	+1'05
1871 . . .	42'02	+0'93	1886 . . .	44'11	+3'02
1872 . . .	43'40	+2'31	1887 . . .	43'51	+2'42
1873 . . .	36'63	-4'46	1888 . . .	39'55	-1'54
1874 . . .	45'73	+4'64	1889 . . .	43'50	+2'41
1875 . . .	43'47	+2'38	1890 . . .	41'77	+0'68
1876 . . .	36'65	-4'49	1891 . . .	37'55	-3'54
1877 . . .	36'81	-4'28	1892 . . .	46'18	+5'09
1878 . . .	47'43	+6'34	1893 . . .	50'16	+9'07

The rainfall of the year 1893 was hence the largest that has been experienced during the past 30 years, and, as already pointed out, the excess was distributed throughout the year.

Table XII shows that the excess was general, and that the rainfall of the year was above the normal in all the 23 areas of that table, with one exception, *viz.*, Malabar and the Ghats, where there was a slight deficiency, averaging 7 per cent.

The rainfall of the year was largely in excess (over 30 per cent.) in the following districts:—

DIVISION.	RAINFALL.		
	Actual, 1893.	Normal.	Variation from normal.
	Inches.	Inches.	Inches.
Central Bengal	74'36	57'15	+17'21
Orissa	80'42	58'51	+21'91
Chota-Nagpur	68'54	52'09	+16'45
North-Western Provinces (East)	53'11	38'18	+14'93
Do. do. (Submontane)	63'35	47'69	+15'66
Oudh (South)	50'17	36'09	+14'08
Do. (North)	51'49	38'95	+12'54
Punjab (South)	21'71	13'76	+7'95
Do. (Central)	27'99	20'94	+7'05
Do. (Submontane)	44'47	30'90	+13'57
Do. (North-West)	35'88	23'16	+12'72
Do. (West)	12'46	9'01	+3'45
Rajputana (West)	24'83	11'78	+13'05
Hyderabad (North)	54'53	35'25	+19'28
Do. (South)	50'62	30'67	+19'95
Madras East Coast (North)	55'02	40'37	+14'65
Do. Do. (a)	85'65	60'21	+25'44

In the first three divisions the large increase was mainly due to excessive rainfall received during the cyclone of the third week of May, and in the last to abnormally heavy rainfall in November. Over the remainder of the area it was due to more frequent and heavier rainfall than usual, especially during the south-west monsoon period.

The rainfall of the year was in moderate excess (*i.e.*, between 10 and 30 per cent.) in the following divisions:—

DIVISION.	RAINFALL.		
	Actual, 1893.	Normal.	Variation from normal.
	Inches.	Inches.	Inches.
East Bengal	107'56	89'84	+17'72
Assam (Surma)	148'98	126'83	+22'15
Deltaic Bengal	80'05	61'80	+18'25
North do.	114'52	99'39	+15'13
Bihar (North)	62'50	51'19	+11'31
Do. (South)	51'99	43'12	+8'87
North-Western Provinces, (Central)	41'17	33'86	+7'31
Punjab (Hills)	70'51	63'89	+6'62
Madras (South Central)	35'93	29'56	+6'37
Mysore	38'79	33'99	+4'80
Khandesh	36'73	32'87	+3'86
Central Provinces (Central)	65'15	51'65	+13'50
Do. do. (East)	62'50	49'94	+12'56
Gujarat	49'23	44'01	+5'22
Madras (Central)	29'86	26'39	+3'47
Do. East Coast (Central)	43'87	35'19	+8'68

In the remaining divisions (except Sind) the rainfall of the year differed by less than 10 per cent. from its normal amount. The following gives data:—

DIVISION.	RAINFALL.			
	Actual, 1893.	Normal.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Assam (Brahmaputra)	81'51	86'97	-5'46	-
North-Western Provinces (West).	29'63	28'80	+0'83	+3
Malabar	117'80	127'13	-9'33	-7
Konkan	111'13	115'10	-3'97	-3
Bombay Deccan	38'80	36'36	+2'44	+7
Berar	42'00	40'11	+1'89	+5
Central Provinces (West)	47'76	44'67	+3'09	+
Kathiawar	32'74	30'16	+2'58	+8
Sind	5'64	6'33	-0'69	-11
Central India (East)	47'46	44'53	+2'93	+7
Rajputana (East), Central India (West).	30'42	28'29	+2'13	+8
Madras East Coast (South)	47'14	43'09	+4'05	+9
Madras (South)	31'07	28'83	+2'24	+

Concluding Summary.

The year 1893 is the fifth of a series characterized by very large and persistent abnormal features, more especially during the cold weather, the meteorological conditions during which period are especially influential in determining the character of the succeeding hot weather and south-west monsoon. The alternate years 1889, 1891 and 1893 were marked by abundant rain in Northern India, and heavy snowfall in the Western Himalayan mountain region, during the cold weather months, whilst in the years 1890 and 1892 the cold weather precipitation was even more markedly in defect than it was in excess in the years 1889, 1891 and 1893.

The precipitation of the cold weather of 1889 in Northern India differed very considerably in character from that of the same period of the years 1891 and 1893 in that it occurred solely during the cold weather months, and was not continued during the succeeding hot weather months of March or April. In the year 1889 the precipitation in the Himalayan and Afghan mountain ranges below 8,000 and 9,000 feet occurred during the greater part of the cold weather period as rain and not as snow, and hence there was no large accumulation of snow on the lower ranges of these mountains at the commencement of the hot weather. It appears to be very probable that the combination of these two features in 1889 was not fortuitous, and that they indicated special characteristic conditions of the upper air movement over Northern India and the adjacent regions to the west, of which the observations in India gave no direct evidence.

The meteorology of the year 1893 resembles that of the year 1891 in several points, the chief of which are as follows:—

1st.—In both years the cold weather period was exceptionally stormy, and the cold weather rainfall in Northern India very largely above the normal of the period.

2nd.—The cold weather periods of both years were hence marked by lower temperature, larger amount of cloud and higher humidity than usual as well as by increased rainfall.

3rd.—The hot weather months were cooler than usual, and temperature was very largely below the normal in March in both years.

1893 differed from 1891 in the important respects that the stormy weather, which gave heavy snow to the Himalayan region, ceased in the month of March, and that unusually fine dry weather prevailed in the Western Himalayas in the months of April and May. In the corresponding months of the year 1891, snow fell at short intervals in that

area, and the accumulation in April and May 1891 was very large compared with that of the corresponding months of the year 1893. This important difference in the character of the snowfall and the snow accumulation was related to large differences in the chief features of the meteorology of the remainder of the year. The following gives the most important of these differences:—

1893.

The hot weather months, April and May, were slightly cooler than usual in Northern India.

(2) The rains commenced at their normal date on the Bengal coast, and were a few days later than usual on the Bombay coast. They advanced even more rapidly than usual into the interior of Upper India, and the whole of India received abundant rain in June.

(3) The rainfall of the monsoon period was above the normal in all districts with the exception of Sind, and was unusually large in amount in the Punjab, North-Western Provinces, Bihar, and Rajputana.

(4) During the retreating south-west monsoon the whole of the Peninsula received abundant rain. The rainfall was large in amount and unseasonable in the Central Provinces and Berar. It was very heavy in the coast districts of Godavary, Kistna, Nellore, Tanjore, and Trichinopoly, which received cyclonic

1891.

The hot weather months, April and May, were characterized by unusually low temperature in North-Western and Central India, the depression below the normal being nearly as large in May as in February.

(2) The rains set in unusually late, more especially on the Bombay coast, and advanced very slowly into the interior, and were not established in the North-Western Provinces and Punjab until the end of July or the beginning of August.

(3) The rainfall of the monsoon period, June to September, was more or less deficient over by far the greater part of India, more especially in the West Punjab, Sind, Rajputana, and the adjacent districts of the Central India.

(4) During the retreating south-west monsoon the central and northern districts of Madras received much less rain than usual, whilst the southern districts obtained somewhat larger amounts. The drought was very pronounced in the coast districts north of Chingleput and the central districts, many parts of which received

1893.

1891.

downpours on more than one occasion. The south-west monsoon retreated somewhat earlier than usual from the Bay, about the middle of December.

barely one-fifth of their normal amount. The south-west monsoon retreated earlier than usual in the beginning of December and was very feeble in November.

The two years hence resembled each other during the first three months of the year, and then differed widely in all their most important features during the remainder of the year. This divergence which commenced in April accompanied and was evidently due to large differences in the snowfall distribution of the months of April and May in these two years over the Western Himalayan mountain area.

The Cold weather period, 1893.—The following table gives mean variation data of the more important meteorological elements for the cold weather months, January and February 1893:—

METEOROLOGICAL PROVINCE.	JANUARY AND FEBRUARY 1893.						
	Variation from normal of mean monthly pressure.	Variation from normal of mean maximum temperature.	Variation from normal of mean minimum temperature.	Variation from normal of mean aqueous vapour pressure.	Variation from normal of mean humidity.	Variation from normal of mean cloud.	Variation from normal of average actual rainfall.
Burma Coast and Bay Islands.	—0.31	—0.2	—0.9	—0.45	—4	0	—0.30
Assam	—0.14	—3.6	—0.7	—0.12	+3	+1.3	+1.45
Bengal and Orissa .	—0.10	—4.9	—1.7	—0.38	0	+1.6	+2.71
Gangetic Plain and Chota Nagpur.	—0.12	—5.7	—1.5	+0.08	+10	+1.7	+2.30
Upper Sub-Himalayas	—0.12	—8.4	—1.1	+0.19	+15	+1.6	+4.48
Indus Valley and North-West Rajputana.	—0.20	—6.7	—1.3	+0.17	+12	+0.4	+1.51
East Rajputana, Central India and Gujarat.	—0.12	—6.0	—2.2	+0.04	+10	+0.8	+0.50
Deccan	—0.21	—4.4	—1.3	+0.20	+8	+0.4	+1.11
West Coast . . .	—0.18	—1.6	—0.7	—0.33	—1	—0.6	+0.41
South India . . .	—0.27	+0.4	+1.6	—0.24	+2	+0.4	+0.32

The following gives corresponding data for the month of December 1892, in order to indicate to what extent the

conditions of January and February 1893 were the direct continuation of similar conditions in December 1892:—

METEOROLOGICAL PROVINCE.	DECEMBER 1892.						
	Variation from normal of mean monthly pressure.	Variation from normal of mean maximum temperature.	Variation from normal of mean minimum temperature.	Variation from normal of mean aqueous vapour pressure.	Variation from normal of mean humidity.	Variation from normal of mean cloud.	Variation from normal of average actual rainfall.
Burma Coast and Bay Islands.	+0.44	—2.1	—2.8	—0.84	—6	—0.4	—0.95
Assam	+0.30	—0.6	—0.3	—0.05	0	—0.2	—0.19
Bengal and Orissa .	+0.43	—0.8	—2.3	—0.54	—5	—0.4	—0.32
Gangetic Plain and Chota Nagpur.	+0.23	—0.3	—1.4	—0.26	—4	—0.1	—0.23
Upper Sub-Himalayas	+0.22	—2.0	—0.1	—0.21	+1	+0.9	+0.55
Indus Valley and North-West Rajputana.	+0.23	—1.5	+0.5	—0.39	—6	+1.4	+0.38
East Rajputana, Central India and Gujarat.	+0.27	—0.5	+0.6	—0.16	—3	+1.5	+0.10
Deccan	+0.34	+1.1	+1.2	—0.03	+1	—0.3	—0.49
West Coast . . .	+0.43	+0.2	—0.6	—0.27	—3	—0.8	—0.62
South India . . .	+0.49	+1.1	—0.9	—0.11	—3	—0.5	—1.72

The preceding data shew that the chief features of the meteorology of the cold weather period of 1893 in India were:—

- (1) Decreased temperature over the whole of India, most marked in Northern India.
- (2) Increased humidity, both relative and absolute, over the whole area, except Burma and the west coast districts.
- (3) Increased cloud over the whole of India, except the west coast districts, and more especially in Northern and Central India.
- (4) Increased precipitation in Northern and Central India, the increase relative to the actual (*i.e.*, the percentage variation) being nearly uniform in amount over the whole of Northern and Central India and the North Deccan.
- (5) Unusually heavy snowfall in the Himalayan and Afghan Mountain areas, greatest in the outer ranges of the Western Himalayas. The most remarkable feature in connection with the snowfall was the low elevation down to which it occurred in January, and the remarkable cold over the whole mountain area bordering North-Western India.

The variations of the chief features of meteorological observation in the cold weather of 1891-92 were opposite in character to those of 1892-93. The following table gives mean variation data of ten meteorological provinces for the cold weather of 1892 for comparison :—

METEOROLOGICAL PROVINCE.	JANUARY AND FEBRUARY 1892.						
	Variation from normal of mean monthly pressure.	Variation from normal of mean maximum temperature.	Variation from normal of mean minimum temperature.	Variation from normal of mean aqueous vapour pressure.	Variation from normal of mean humidity.	Variation from normal of mean cloud.	Variation from normal of average actual rainfall.
Burma Coast and Bay Islands.	-.028	+0.4	-0.6	-.028	-3	-0.5	+0.07
Assam	-.045	+1.8	+1.9	+0.30	-1	+0.7	+0.97
Bengal and Orissa	-.030	+2.6	+1.7	-.007	-6	0	-0.96
Gangetic Plain and Chota Nagpur.	-.030	+2.3	+1.9	+0.19	-2	-0.4	-0.06
Upper Sub-Himalayas	-.020	+2.3	+1.6	-.006	-3	-0.1	-1.33
Indus Valley and North-West Rajputana.	-.033	+3.1	+2.6	+0.07	-4	+0.5	-0.53
East Rajputana, Central India and Gujarat.	-.027	+2.4	+3.4	+0.51	+4	0	+0.46
Deccan	-.018	+1.6	+2.1	+0.04	-1	-0.4	+0.08
West Coast	-.033	+1.7	+0.6	-.002	-3	-0.6	-0.28
South India	-.020	+0.7	+0.8	+0.13	-1	+1.5	-0.42

The preceding data show that in the cold weather of 1891-92, temperature was more or less considerably above the normal over the whole of India, the amount of cloud generally less than usual, the amount of aqueous vapour in the air normal, but the relative humidity in considerable defect, and the rainfall more or less considerably below the normal, except in one area (Assam), which received earlier spring rains than usual in consequence of the abnormally early commencement of the hot weather.

It is evident that in each of these two cold weather seasons the temperature, humidity and cloud conditions were strictly related to the rainfall of the period, and hence also to the number and character of the cold weather storms of the period.

In the cold weather of 1891-92 there were remarkably few storms or depressions, whereas in the cold weather of 1892-93 they were more numerous than usual, and followed in rapid succession during the months of January and February 1893.

A reference to the tables of variation data for the cold weather periods of 1891-92 and 1892-93 shows that in both periods pressure was below the normal in the Indian area. The mean pressure of the whole area in the cold weather period of 1891-92 was .028 inch below the normal, and the only important local feature was a slight deficiency of pressure in Assam. Pressure was also in general defect in the cold weather of 1892-93 by amounts averaging .018 inch, and was in slight relative excess in Northern India, and in equally slight defect in Southern India and Burma.

It is hence evident, as pointed out in previous annual reviews, that the pressure conditions at the level of the plains do not explain or account for the large characteristic differences from year to year in the meteorology of the cold weather periods. As pointed out in the annual review of 1892, there is only one feature of the pressure distribution in India which throws some light upon the causes of the great variation from year to year in the character and number of the cold weather storms, *viz.*, the relation between the pressure variations at the hill stations and the neighbouring plain stations, as indicating an abnormal excess or defect of pressure in the middle or higher atmospheric strata.

The following table gives vertical pressure anomalies for the cold weather period of 1892-93 :—

HILL AND PLAIN STATIONS.	VERTICAL PRESSURE ANOMALY.						
	September 1892.	October 1892.	November 1892.	December 1892.	January 1893.	February 1893.	Mean of period November 1892 to February 1893.
Leh and Lahore	+0.13	+0.24	-.001	-.006	-.064	-.113	-.046
Quetta and Jacobabad	+0.37	+0.17	+0.18	+0.01	+0.01	-.049	-.007
Murree and Rawalpindi	-.009	-.007	-.001	-.004	-.048	-.073	-.032
Simla and Ludhiana	+0.08	-.023	-.024	-.034	-.050	-.088	-.049
Chakrata and Roorkee	+0.16	-.009	+0.07	+0.05	-.027	-.073	-.022
Ranikhet and Bareilly	+0.27	+0.14	+0.34	+0.28	+0.12	-.024	+0.13
Darjeeling and Dhubri	-.009	-.004	+0.05	-.003	-.015	-.020	-.008
Mount Abu and Deesa	?	?	?	?	+0.03	-.044	?
Pachmari and Hoshangabad	+0.04	-.001	+0.05	+0.13	+0.09	-.009	+0.05

The preceding table establishes that the vertical pressure anomalies in the cold weather of 1893 were negative, thus indicating deficient pressure in the middle atmospheric strata relative to the lower. This feature began to be exhibited in the preceding months of October and November.

The following table gives the mean vertical pressure anomalies for the period, November to February, of the past five years for comparison :—

PAIR OF STATIONS.	VERTICAL PRESSURE ANOMALY.				
	1892-93.	1891-92.	1890-91.	1889-90.	1888-89.
Leh and Lahore	-.046	+0.40	-.025	+0.53	+0.28
Quetta and Jacobabad	-.007	+0.63	-.038	+0.47	-.013
Murree and Rawalpindi	-.032	+0.37	?	?	?
Simla and Ludhiana	-.049	+0.17	-.020	+0.37	-.014
Chakrata and Roorkee	-.022	+0.39	+0.15	+0.77	+0.20
Ranikhet and Bareilly	+0.13	+0.30	?	?	?
Darjeeling and Dhubri	+0.08	+0.26	-.004	+0.39	?
Mount Abu and Deesa	?	+0.27	+0.16	?	?
Pachmari and Hoshangabad	+0.05	+0.24	?	?	?

The cold weather periods of 1889-90 and 1891-92 were characterized by deficient rainfall, and those of the remaining three years by unusually heavy rainfall. There is hence strong evidence in the meteorology of the cold weather seasons in India during the past five years for the following conclusions :—

- (1) Pressure is invariably in defect at the hill stations relatively to the adjacent plains in Northern India, and hence in the middle atmospheric strata in Northern India, in cold weather seasons of abundant rainfall.
- (2) Pressure is invariably in excess in the middle atmospheric strata over Northern India (*i.e.*, vertical pressure anomalies are positive,) in cold weather seasons of deficient rainfall.
- (3) The mean variations in the cold weather rainfall over Northern India from season to season are, roughly speaking, proportional to the magnitude of the vertical pressure anomalies of the period.
- (4) The character of the vertical pressure anomalies during the cold weather, and hence of the probable cold weather rainfall, are usually indicated in the preceding months of November and December, more especially when considered in combination with the character of the rainfall of the preceding south-west monsoon.

Some speculations on these matters will be found in pages 531-2 of the Annual Review for the year 1892, and it is not necessary to repeat them.

The cold weather of 1892-93 was hence characterized by abundant precipitation in the plains and adjacent mountain districts of Northern India. This was due to the occurrence of an unusually large number of storms of the cold weather type. These storms undoubtedly originate and have their chief activity in an upper air current, and not in the lower air currents which prevail in India during the cold weather. The existence of abnormal conditions in this upper (humid) air current over India in the cold weather of 1892-93 was indicated by the relative deficiency of pressure in the middle atmospheric strata. These disturbed conditions followed, and were probably in part (if not entirely) a result of unusually heavy rainfall during the previous south-west monsoon period, which modified the strength of the upper currents and their relation to the lower air currents during the south-west monsoon and for some time afterwards.

Two of the more remarkable features of the cold weather in 1892-93 were the abnormal cold in the hill districts of Northern India and the unusually low elevations to which snow fell. The season was described in many of the reports of the weather and snowfall in the Himalayan and Afghan districts, as "the coldest

winter during the past 50 years," and "the coldest winter in the memory of man." These remarks may be a little exaggerated, but they undoubtedly represent a condition of the cold weather in the hill districts. The two features stated above are undoubtedly strictly related, as the temperature of the air in the hills during stormy seasons is determined by the character and amount of the snowfall. The falling snow cools the air during its descent, and the temperature of the snow and hence also of the air through which it falls depends upon the height at which the condensation of the aqueous vapour occurs. In the case of prolonged snowstorms over the lower ranges of the Western Himalayas, the condensation and precipitation frequently commence as rain, and shortly afterwards change to sleet, and finally to dry snow, and the temperature of the air decreases *pari passu*. It is hence very probable that the condensation during such storms does occur at increasing elevations throughout each disturbance, and that the decreasing temperature of the air in the hill districts is chiefly, if not entirely, due to that cause. It may hence be inferred that the special features of the snow precipitation and of the temperature of the air in the hill districts in the cold weather of 1892-93 were due, in part at least, to condensation on the average of the whole period occurring at a higher level throughout the period than usual. This may have been either due to a general higher elevation of the upper rain-giving current, or to its containing less aqueous vapour than usual, or to its being less humid than usual due to increased temperature, and hence requiring increased ascensional movement to give rise to condensation. It may also be noted that, according to newspaper accounts, the winter of 1892-93 was unusually severe and the cold intense in China. If this severe cold extended over the whole of Central Asia, it is possible the unusual cold in the Western Himalayas and Afghanistan may have been, in part at least, a result of the conditions in Central Asia. Exploration of the atmosphere, by means of balloons, is hence greatly to be desired in India to determine the conditions which modify to so large an extent the amount and character of the cold weather precipitation in Northern India and hence also of the temperature and other conditions of the period.

An examination of the Indian monsoon area charts, and of the charts issued by the English Meteorological Society, indicate that four of the eight cold weather storms which affected the weather in Northern India during the months of January and February 1893 formed in Baluchistan or Upper India and four advanced from Persia. Three of the latter storms certainly originated in Persia, and the fourth either formed in that area during a period of disturbed weather in Western Asia generally or advanced from the Mediterranean. So far as can be judged from the somewhat imperfect data at present available, they

originate in the majority of cases as thermal disturbances in the plateau area of South-West Asia. If the convectional and ascensional movement occur up to a sufficiently great elevation, the cyclonic whirls generated by the thermal disturbances extend upwards into the upper atmospheric current over the Persian area and Northern India area, and are then carried forward in an easterly direction by that upper current. This explanation is only made provisionally, but appears to be necessary to supplement the theory of their origin given in the "Account of the cold weather storm of Northern India," and it undoubtedly accounts for the frequent origin of depressions in the Persian area and North-Western India during the cold weather and hot weather periods, and also for the fact that a considerable proportion of these depressions are almost stationary, whilst the remainder travel in a nearly uniform easterly direction, and at nearly uniform rate of 400 miles per diem. It may also be noted that, if these depressions originate as thermal disturbances, the plateau area of Persia and Baluchistan, which is during the cold weather in the southern quadrant of the great anti-cyclone lying over Central Asia and Russia, is peculiarly favourable for the formation and development of such disturbances. The continued publication of the Indian monsoon charts for a period of three or four years will, it is hoped, settle these and cognate questions fully. They have already clearly established the important part which the plateau of Iran plays in determining and modifying the weather in India during the cold season.

The hot weather period, March to May 1893.

—It has been pointed out in the previous paragraphs that the hot weather in Northern and Central India did not commence until nearly the end of March or a month later than usual, and that the conditions of March were similar in all their more important features to those of the cold weather months of January and February. It is hence necessary to consider the meteorology of March 1893 separately.

The month was remarkable for unusually low temperature (averaging $4\frac{1}{2}^{\circ}$ below the normal in Northern India), much higher humidity than usual, an abnormal amount of cloud and much heavier precipitation than usual. There were three well-marked disturbances of the cold weather type, two of which originated in Sind and Baluchistan, and the third in Persia. These advanced in the usual easterly direction across Northern India, and gave more or less general rain in Northern and Central India. The snowfall during the month in the Western Himalayan area was also large in amount and much above the average, and added further to the already large accumulation of snow in that area.

The temperature, humidity and cloud conditions of the month were evidently determined by the snowfall accumu-

lation in the Himalayan area and by the occurrence of cold weather storms much later than usual. As one at least out of the three storms in March originated in or passed through Persia, the weather conditions in India during the month were to some extent determined by those prevailing in Persia, as in the previous cold weather months of January and February.

The following table gives the mean variations of the more important elements of observation of ten meteorological provinces in March 1893:—

METEOROLOGICAL PROVINCE.	MARCH 1893.						
	Variation of pressure from normal.	Variation of maximum temperature from normal.	Variation of minimum temperature from normal.	Variation of humidity from normal.	Variation of aqueous vapour pressure from normal.	Variation of cloud from normal.	Variation of rainfall from normal.
Burma Coast and Bay Islands.	-.008	-1.2	-0.5	-5	-.062	+0.5	+0.65
Assam	+.027	-3.8	-2.6	+2	-.041	+0.7	-1.83
Bengal and Orissa . .	+.035	-6.9	-3.7	+2	-.065	+1.7	+0.54
Gangetic Plain and Chota Nagpur	+.034	-7.2	-3.8	+9	+.006	+0.9	+0.40
Upper Sub-Himalayas	+.032	-8.0	-3.8	+9	+.001	+0.4	+0.06
Indus Valley and North-West Rajputana.	+.016	-3.4	-2.4	-1	-.038	-0.9	-0.12
East Rajputana, Central India and Gujarat.	+.015	-5.4	-2.7	+6	-.013	+0.1	+0.36
Deccan	+.017	-8.5	-3.6	+13	+.063	+0.7	+2.67
West Coast	-.014	-1.1	-1.4	-2	-.042	-0.7	+0.88
South India.	-.002	-2.9	+0.3	+3	-.005	+1.5	+1.56

The month of March was characterized by special features which differentiated it from the preceding two months. In the first place, notwithstanding the disturbed stormy weather, the rainfall in the Punjab plains was slightly less than the normal. It was also below the normal in Assam, but as the rainfall in that area in March is usually due to hot weather actions, and is large in amount, the deficiency was due to the delay in the establishment of the hot weather. The rainfall of the month was large in amount over the remainder of India and was excessive (when compared with the normal) in the Peninsula and Central India, many districts receiving from ten to twenty times their normal small fall of the month. The excess was most marked in the Central Provinces, Berar, Hyderabad and North and Central Madras.

The rainfall of the month, due in part to cold weather disturbances, was hence very abnormally and irregularly distributed. Stormy and rainy weather in the months of January and February is frequently, but not invariably, followed by exceptional precipitation in the month of March. Thus the cold weather of 1890-91 was followed by remarkably heavy rain in March 1891 over Bihar and the eastern districts of the North-Western and Central Provinces.

In the year 1891 as in 1893 the snowfall occurred down to unusually low levels, thus indicating, as already pointed out, the probable existence of abnormal temperature and other conditions in the upper currents over India and the Persian area. These conditions, combined with the larger contrasts of temperature between Tropical and Extra-tropical India, and between the Indian land area and the Indian seas due to the severe winter and heavy snowfall in the Himalayan region in January and February, gave rise in the following month to a period of slightly disturbed weather with frequent thunderstorms and hailstorms.

The actual conditions of the month were very remarkable.

In Northern India rain occurred partly in connection with three disturbances of the cold weather type during the month and partly in connection with hot weather disturbances originating in Central India, the Central Provinces and Southern India. It was received chiefly during the following periods, the 5th to 12th, the 14th and 15th, the 16th to the 23rd, and the 25th to the 28th. The disturbances commencing in India on the 5th and the 6th originated in the North-West frontier districts and the last in Persia.

In the Peninsula, including Berar and the Central Provinces, the rainfall occurred chiefly during the period, from the 1st to the 13th. Almost daily rain was received from thunderstorms during this period in the Central Provinces, Berar, Hyderabad, Khandesh, Bombay, the Deccan and North and Central Madras. Hence the rainfall in March in Northern India was due to, and associated with, definite and specific cyclonic disturbances, whereas in the Peninsula it accompanied, and was due to, general and feebly unsettled conditions accompanying thermal disturbance over a large area. During the period from March the 1st to the 15th, pressure was steadily and largely above the normal over the whole of India, the excess, as might be anticipated from the conditions, being greatest in Northern India. The following gives average variation data for every fourth day from the 1st to the 13th :—

PROVINCE.	VARIATION OF PRESSURE FROM NORMAL.			
	1st.	5th.	9th.	13th.
Burma	+ '037	+ '057	+ '070	+ '019
Bengal and Assam	+ '103	+ '126	+ '169	+ '072
North-Western Provinces and Oudh.	+ '139	+ '086	+ '172	+ '097
Punjab	+ '184	+ '039	+ '181	+ '085
Sind and Rajputana	+ '158	+ '011	+ '169	+ '076
Gujarat and Central India	+ '106	— '008	+ '105	+ '069
Central Provinces and Berar.	+ '098	+ '055	+ '151	+ '063
Bombay	+ '042	+ '024	+ '045	— '025
Madras	+ '063	+ '042	+ '074	— '006

The following gives mean temperature variation data for the same dates :—

PROVINCE.	VARIATION OF MEAN DAILY TEMPERATURE FROM NORMAL.			
	1st.	5th.	9th.	13th.
Burma	+0'4	—0'7	+0'6	+2'5
Bengal and Assam	—6'3	—5'6	—4'5	—4'0
North-Western Provinces and Oudh.	—7'5	—3'8	—3'9	—7'0
Punjab	—5'9	+0'2	—5'4	—2'6
Bombay	—2'6	+0'4	—1'4	—1'3
Central Provinces and Berar.	—7'7	—4'4	—11'4	—10'1
Central India and Gujarat	—4'2	+1'0	—3'3	—6'4
Sind and Rajputana	—4'6	+1'9	—2'9	—2'5
Madras	—1'3	—0'7	—1'2	—0'8

The excessive pressure in India, which was in part at least due to the abnormally low temperature, throws no light on the peculiar features of the meteorology of the period. On the other hand, it is difficult to separate the temperature conditions determining the rainfall from those resulting from the rainfall. The following data however show that the atmosphere was in the abnormal state which accompanies large thermal disturbance in India, indicated by very irregular local changes of pressure. The magnitude of the mean changes over large areas is of little or no significance at such times :—

DATE.	PRESSURE CHANGE IN 24 HOURS PRECEDING 8 A.M. OF DATE.				Range of variation at these four stations.
	Chanda.	Nagpur.	Jubbulpore.	Akola.	
1st	"	"	"	"	"
2nd	— '022	— '060	— '028	— '047	'038
3rd	+ '038	+ '041	+ '039	+ '066	'028
4th	— '034	— '001	+ '002	— '017	'036
5th	+ '032	— '012	— '089	— '038	'121
6th	+ '022	+ '021	+ '034	+ '003	'031
7th	— '021	+ '013	+ '008	+ '049	'070
8th	+ '025	+ '054	— '002	+ '001	'056
9th	+ '030	— '003	+ '082	+ '008	'085
10th	— '064	— '085	— '024	— '112	'088
11th	— '030	— '015	— '049	+ '002	'051
12th	— '036	— '023	+ '007	— '026	'043
13th	+ '028	+ '003	+ '000	+ '014	'025
14th	— '027	— '001	— '028	+ '007	'035
15th	— '038	— '054	— '056	— '035	'021
16th	— '029	— '015	— '051	— '045	'036
17th	— '052	— '060	— '067	— '027	'040
18th	— '037	— '049	— '050	— '065	'028

The preceding data show fully the very great irregularity of the pressure changes in the area they represent, including the Central Provinces and Berar. The chief feature during this period was, not the large excess of pressure over the whole of India, but the large relative local changes in the north and centre of the Peninsula. These large and apparently irregular local changes, it

may be noted, only occur in India during the disturbed weather which manifests itself in thunderstorms and hailstorm, and are hence directly due to thermal actions.

The conditions of March were, as already pointed out, very abnormal in this respect, that although weather was very disturbed and the rainfall excessive in the Peninsula and Bengal, the rainfall was normal or in slight defect in Upper India. There is a slight tendency for stormy weather in Northern and Central India during the cold weather period proper to be followed in March by disturbed weather of an intermediate type between that of cold weather storms and of hot weather disturbances, as, for example, was the case in 1891 and 1889. A marked feature accompanying this transition is the change from negative to positive vertical pressure anomalies at the hill stations in Upper India. The change was very marked in March and April 1893.

The following table gives the vertical pressure anomalies as determined from the variation data of six pairs of stations in Northern India :—

PAIR OF STATIONS.	VERTICAL PRESSURE ANOMALY IN		
	February 1893.	March 1893.	April 1893.
	"	"	"
Leh and Lahore	-.113	-.063	+.074
Murree and Peshawar	-.081	-.048	+.021
Simla and Ludhiana	-.085	-.051	+.027
Darjeeling and Calcutta	-.060	-.039	+.004
Mount Abu and Deesa	-.063	-.012	+.003
Quetta and Jacobabad	-.079	-.011	+.048

Temperature increased rapidly in the beginning of April, and periods of increasing and excessive temperature alternated with periods of slight disturbance characterized by thunderstorms or duststorms over the greater part of India during April and May. The chief periods of disturbance were from the 20th to 23rd April, the 1st to the 5th May, the 8th to the 13th, and the 23rd or 24th to the end of the month. During the last period, from the 24th to 31st, a cyclonic storm formed in the Bay and advanced through Bengal into Cachar. It gave an excessive down-pour in South Bengal and Orissa.

The highest temperature of the year in India was recorded at Jacobabad on the 7th of May, in the interval between the second and third disturbed periods. A very hot period in the Punjab and Rajputana immediately preceded and accompanied the formation of the last disturbance of that month. The mean temperature of the 25th (*i.e.*, the 24-hour period preceding 8 A.M. of the 25th) was, for example, 11° above the normal of the day at Sirsa and 12° at Lahore and Sialkot. The temperature during this hot period was by no means so excessive as frequently

occurs in Upper India immediately before the advance of the monsoon currents. This is shown by the following data of the past five years :—

DATE OF HOTTEST DAY.	VARIATION OF MEAN TEMPERATURE FROM NORMAL ON HOTTEST DAY OF YEAR IN		
	Sind.	Punjab.	Rajputana.
	°	°	°
25th May 1893	+0.3	+8.2	+1.9
21st " 1892	+2.4	+12.0	+6.7
4th June 1891	+2.2	+4.4	+6.5
26th May 1890	+2.6	+10.0	+7.5
3rd June 1889	+4.8	+6.0	+9.6

Hence, as stated in the May review (*vide* page 195), the temperature conditions preceding the south-west monsoon were less strongly marked than is usually the case, and were much less pronounced in May 1893 than in May 1892, and notwithstanding this, the monsoon currents advanced earlier and more strongly at the commencement of the south-west monsoon season in 1893 than in 1892, thus confirming the conclusion stated in previous annual reviews and reports that the temperature conditions in Northern or Upper India do not constitute the predominant factor which determines the strength or time of advance of the monsoon currents.

The following table gives the mean variation of the more important meteorological elements in the ten meteorological provinces of India for the hot weather period, March to May 1893 :—

METEOROLOGICAL PROVINCE.	HOT WEATHER, 1893.						
	Variation of pressure from normal.	Variation from normal of maximum temperature.	Variation from normal of minimum temperature.	Variation from normal of aqueous vapour pressure.	Variation from normal of humidity.	Variation from normal of cloud.	Variation of average actual rainfall from normal.
	"	°	°	"	°	°	"
Burma Coast and Bay Islands.	-.016	-2.2	-0.5	-.037	0	+1.1	+12.08
Assam	-.002	-1.4	-0.7	-.003	+1	+0.2	-4.77
Bengal and Orissa	-.005	-4.8	-1.8	-.031	+2	+1.5	+10.48
Gangetic Plain and Chota Nagpur.	+.007	-4.5	-1.7	+.039	+8	+0.8	+1.96
Upper Sub-Himalayas	+.012	-4.8	-1.3	+.070	+10	+0.3	+1.13
Indus Valley and North-West Rajputana.	-.005	-0.2	0	+.038	+2	-0.6	+0.30
East Rajputana, Central India and Gujarat.	+.004	-2.3	-0.6	+.024	+5	+0.3	+0.87
Deccan	+.001	-4.4	-1.0	+.055	+8	+0.6	+4.51
West Coast	-.010	-0.9	-0.6	-.023	-1	+0.4	+5.93
South India	-.013	-1.6	-0.7	-.025	+1	+0.7	+1.22

As the month of March 1893 was characterized by cold rather than by hot weather conditions in Northern and Central India, the following table gives corresponding

data for the months of April and May 1893, which really formed the hot weather period of that year :—

METEOROLOGICAL PROVINCE.	APRIL AND MAY, 1893.						
	Variation from normal of mean pressure.	Variation from normal of mean maximum temperature.	Variation from normal of mean minimum temperature.	Variation from normal of mean aqueous vapour pressure.	Variation from normal of mean humidity.	Variation from normal of mean cloud.	Variation from normal of average actual rainfall.
Burma Coast and Bay Islands.	-.021	-2.7	-0.6	-.024	+ 3	+1.4	+12.25
Assam	-.017	-0.3	+0.3	+.017	+ 1	0	- 2.94
Bengal and Orissa .	-.025	-3.8	-0.9	-.014	+ 2	+1.4	+ 9.94
Gangetic Plain and Chota Nagpur.	-.007	-3.2	-0.7	+.055	+ 8	+0.8	+ 1.56
Upper Sub-Himalayas	+.003	-3.2	0	+.105	+11.	+0.2	+ 1.07
Indus Valley and North-West Rajputana.	-.015	+0.7	+1.3	+.076	+ 4	-0.4	+ 0.42
East Rajputana, Central India and Gujarat.	-.001	-0.8	+0.5	+.043	+ 4	+0.4	+ 0.51
Deccan	-.008	-2.3	-1.0	+.051	+ 6	+0.6	+ 1.88
West Coast	-.009	-0.8	-0.2	-.014	0	+0.9	+ 5.05
South India	-.019	-1.0	-1.3	-.035	-1	+0.3	- 0.34

The previous tables show clearly the chief features of the meteorology of the period. Pressure was in slight general defect in April and May by amounts averaging -.012 inch for the whole of India. Relatively to the general condition pressure was locally in slight defect in the Peninsula and North-Eastern India and in slight excess in North-Western India. The local anomalies were however in all cases very small, and hence the chief feature of the pressure distribution was its close approximation to the normal distribution in the plains of India.

The following table gives vertical pressure anomalies in Northern India, determined from the variation data of six pairs of stations in Northern India. It will be seen they indicate that there was a moderate relative excess of pressure in the middle atmospheric strata :—

April.

HILL STATION.	Variation from normal of mean monthly pressure.	Neighbouring plain station.	Variation from normal of mean monthly pressure.	Vertical pressure anomaly (Hill-Plain).
Leh	+.050	Lahore	-.024	+ .074
Murree	-.009	Peshawar	-.030	+ .021
Simla	-.009	Ludhiana	-.036	+ .027
Darjeeling	-.011	Calcutta	-.015	+ .064
Mount Abu	-.017	Deesa	-.020	+ .003
Quetta	+.038	Jacobabad	-.010	+ .048

May.

HILL STATION.	Variation from normal of mean monthly pressure.	Neighbouring plain station.	Variation from normal of mean monthly pressure.	Vertical pressure anomaly (Hill-Plain).
Leh	+.014	Lahore	0	+ .014
Murree	-.001	Peshawar	-.021	+ .020
Simla	+.004	Ludhiana	-.009	+ .013
Darjeeling	+.007	Calcutta	-.039	+ .046
Mount Abu	-.018	Deesa	-.003	- .015
Quetta	-.009	Jacobabad	-.010	+ .001

The preceding data establish that pressure was relatively in excess at the hill stations in Upper India as compared with the adjacent plains, a condition that generally accompanies less disturbed weather than usual in North-Western India in the cold and hot weather periods. The vertical pressure anomalies were moderate in amount in April and small in May, and hence the pressure conditions prevailing in India during May, immediately before the advent of the monsoon, were not marked by any large variations from the normal, either generally over the whole monsoon area or locally at the level of the plains in India or at the elevation of the hill stations in Northern India.

The table giving mean variation data for the hot weather period, April and May 1893, also establishes that it was characterized by a larger amount of cloud over the whole of India, by a larger amount of rain than usual (especially in Burma, Bengal and the west coast districts) and by decreased day temperature and, with a few exceptions, decreased night temperature and hence by diminished mean daily temperature. The hot weather conditions antecedent to the rains, from whatever point they are considered, were less strongly marked than usual. They were less prolonged, as they commenced later than usual and terminated earlier than usual in May. The highest temperatures registered during the period were lower than usually occur, and the mean temperature of the period was in moderate defect, and, notwithstanding that the hot weather conditions were less intense and less prolonged than usual, they were followed by a stronger monsoon and heavier monsoon rains than usual.

The south-west monsoon period.—The conditions antecedent to the south-west monsoon of 1893 in the Indian land area were not unfavourable to the establishment of a strong and early monsoon. The following gives the most influential and prominent features of the antecedent meteorological conditions :—

1st.—Unusually heavy rain in Northern India and excessive snowfall with abnormal cold in

the Himalayan and Afghan mountain area in January and February. The precipitation though heavier than usual ceased about the normal period, *viz.*, at the end of March.

and.—Large snow accumulation in the Himalayan mountain area in February and March, which however rapidly disappeared in the month of April during which weather was drier and the air warmer and clearer than usual in Upper India and Baluchistan.

3rd.—Ordinary hot weather conditions (in a slightly feeble form than usual) during the months of April and May in Northern and Central India.

4th.—Temperature below the normal at the lower Himalayan hill stations as in the plains of Northern India, but above it to a moderate extent in Sind and the West Punjab and also at Leh, Kailang, Quetta, Baghdad, Bushire and Meshed, and hence perhaps over the greater part of Central and Western Asia.

5th.—The prevalence during April and May of finer weather than usual on the whole in the Himalayan area. There was no heavy snowfall, such as occasionally occurs in that area during these two months, and modifies for some time afterwards the pressure and temperature conditions of Northern India.

6th.—The pressure conditions were very approximately normal and exhibited no marked abnormal features. The mean pressure of the whole of India was in slight defect (averaging '012 inch for the two months of April and May). Pressure was relatively to the general condition in slight local excess in Northern India and in very slight local defect in the Peninsula. These variations were too small to be of importance, except so far as they indicated the absence of large abnormal conditions.

The large snow accumulation and extension of the snow-clad covering in the Himalayan area in February and March accompanied very large and important variations of the meteorological conditions in India from the normal. The rapid re-establishment of approximately normal conditions in the Himalayan area in April was clearly indicated by the small variations of the mean pressure and temperature conditions of that month and of May in the plains of India from the normal. The snowfall conditions in the Himalayan area were hence not an important factor in 1893 in modifying the distribution of the south-west monsoon rainfall. It is however possible that the weakness of the Bombay current (as compared with the Bengal current) may

have been partly or mainly determined by the antecedent snowfall conditions in the Western Himalayan area.

The meteorological conditions in India antecedent to the establishment of the south-west monsoon were hence, on the whole, not unfavourable to the extension of the monsoon currents over India. The rapidity of their extension and the subsequent rainfall were hence mainly dependent upon the initial strength and volume of the currents. The conditions in India itself were, as stated above, not unfavourable (although, on the other hand, they cannot be said to have been distinctly favourable) to a strong monsoon, but were not, on the other hand, such as the furnace theory of the origin of the monsoon indicates or suggests to be favourable. The indications (from what might be termed external conditions as opposed to those referred to above that the monsoon currents were likely to be stronger than usual are as follows:—

1st.—The occurrence of temporary advances of humid winds to Ceylon, South India and Tenasserim earlier than usual.

2nd.—Excessive rainfall in Ceylon, Malabar and Tenasserim and at Port Blair in April and the first half of May. The following gives rainfall data for Colombo, Mangalore, Port Blair and Tavoy for these two months:—

STATION.	APRIL.		MAY.		PERIOD, APRIL AND MAY.	
	Actual rainfall of month.	Variation from normal.	Actual rainfall of month.	Variation from normal.	Variation of actual rainfall of period from normal.	Percentage variation.
	"	"	"	"	"	
Colombo	20'34	+9'06	10'32	—2'52	+6'54	+27
Mangalore	2'78	+2'17	11'86	+4'09	+6'26	+75
Port Blair	18'91	+6'73	12'53	—3'21	+3'52	+13
Tavoy	9'79	+5'96	33'44	+16'67	+22'63	+110

3rd.—The strength of these temporary advances, indicated in part by the increased rainfall in Southern India, Ceylon, and Tenasserim, and in part by the exceptional character of the two cyclonic storms which were generated in the Bay during these advances.

The first storm formed near the Andamans and advanced into Burma in the last week of April. The second formed in the north of the Bay in the last week of May. The first occurred abnormally early, as cyclonic storms rarely form in the Bay before the first or second week of May. The second was remarkable for its intensity and the excessive rainfall which accompanied it.

There were hence indications in April and May that there was a stronger determination than usual of humid winds from the equatorial belt northwards to the Indian area, and more especially up the Bay of Bengal, and hence, in virtue of the strongly marked tendency for the monsoon currents to maintain the same general features (amidst a certain amount of oscillatory variation) throughout the whole season, there was a strongish probability, based on these antecedent conditions and actions in April and May, that the monsoon currents would be stronger than usual, and that of the two branches of the monsoon current, the Bay of Bengal branch would probably be stronger relatively to the normal than the Bombay current. In connection with this it may be noted as something more than an interesting coincidence that the rainfall at Zanzibar from January to April 1893 is reported to have been about 50 per cent. above the normal.

The inference was in accordance with facts, as both currents, but more especially the Bengal current, were above their normal strength. The chief features establishing the increased intensity and volume of the currents were:—

- 1st.—The strength of the temporary and early advances of southerly humid winds in the Bay in April and May.
- 2nd.—The rapid extension of monsoon conditions in June over the whole of India.
- 3rd.—The steadiness and increased strength of the lower air movement in India during the monsoon period, June to September, and more especially at the coast stations of the north of the Bay of Bengal.
- 4th.—The absence of cyclonic storms in the Bay between the middle of June and the end of August.
- 5th.—Rainfall in excess over nearly the whole of India, the excess, relatively to the normal precipitation of the period, increasing from the coast districts to the more distant interior districts of Rajputana, the North-Western Provinces and the Punjab.

The phenomena of the south-west monsoon of 1893 in India show very forcibly that the so-called furnace theory is a very inadequate and unsatisfactory explanation of the advance of the monsoon currents into India. It is now generally accepted that the south-west monsoon circulation is an extension of the south-east trades air movement. The extension follows and accompanies the establishment of certain pressure and temperature conditions in Southern and Central India. During the north-east monsoon the south-west trades system is a stable circulation or air movement. The changes of conditions in the Indian area in April and May convert it into an unstable system. They diminish the resistance to its northward

extension to so large an extent that, amidst the oscillatory changes always in progress in the atmosphere, the forces acting on that mass of air impel it forward and its advance is hence a progress from the equatorial belt towards India, and is not an increasing indraught to a hot area due to an intensification of the thermal conditions and actions.

The Indian monsoon area charts for 1893 show clearly that when the monsoon currents were strongest in India the extension of the south-east trades across the equatorial belt was also strongest and most plainly exhibited.

The monsoon currents of 1893 were stronger and gave more rain than usual in India. There were no special meteorological conditions in India which would explain the unusually early and strong temporary advances or the early and strong permanent advance of these currents. The only possible explanation hence appears to be that the character of the advances as well as the time of the initial advance depend to a far larger extent upon conditions in the south-east trades (and hence in the Indian Ocean south of the equator) than has hitherto been supposed by meteorologists. If this be the case, it is evident that the full explanation of the monsoon features in India will not be possible until the meteorology of Australia and the Indian Ocean (and perhaps also of the Antarctic Ocean) has been fully linked on to that of the Indian monsoon area, when perhaps it may be possible to ascertain the missing factors necessary to complete the explanation of the relations between the chief features of the monsoon currents and rainfall in India and the antecedent and concurrent conditions in the Indian area and the regions to the south.

The following gives a very brief summary of the chief features of the south-west monsoon air currents and rainfall in 1893:—

Temporary advances of the south-west humid winds occurred earlier than usual in the Bay. The two chief advances gave rise to cyclonic storms, the second of which was of considerable intensity and gave a deluge of rain to Orissa, South and East Bengal, Cachar and Manipur during the last week of May.

The permanent advance occurred in the first week of June in the Arabian Sea, and gave rise to a feeble cyclonic depression which, so far as can be judged from the very limited available information, did not advance beyond the initial stage of a cyclonic storm. The monsoon current from the Bombay Coast advanced with greater rapidity than usual across Central India and Rajputana. The following gives the dates of the first general rainfall in those provinces usually dependent upon the Bombay current for their south-west monsoon precipitation:—

Berar	15th June.
Central Provinces	17th "
Central India	18th "
Rajputana	22nd to 26th June.

The permanent advance in the Bay occurred during the second week of June, and as usual a cyclonic storm formed in front of the advancing humid winds. This storm crossed the Ganjam and Circars coasts and marched along a curved track to Baghelkhand. It initiated true monsoon winds and rainfall in the Gangetic plain. The following gives the dates of the establishment of the monsoon proper in Northern India:—

Bengal	14th June.
Chota Nagpur	14th „
Bihar	14th „
North-Western Provinces East and Oudh	18th „
North-Western Provinces West	25th „
Punjab	23rd „

Both currents hence advanced much more rapidly than is usual from the coast districts to the interior of Upper India. They were also abnormally strong during the remainder of June, during which month the whole of India, with the exception of Burma, Assam and North Bengal, received abundant rain. The south-west monsoon trough of low pressure occupied its normal position during the month, stretching from the Orissa coast through Allahabad and Agra to Mooltan.

The Bengal current was stronger than usual in July, but the Bombay current fell off to some extent and was slightly below its normal intensity. Northern India obtained more abundant rain than usual (partly at the expense of Burma and Assam). The north of the Peninsula and Kathiawar, Gujarat and East Rajputana received less rain than usual, whilst the southern half of the Peninsula obtained larger amounts. This diversion of the Bombay current southwards was evidently in part due to its want of strength.

Both currents were very probably below their normal strength and volume in August, and the rainfall in India was generally below the normal, the deficiency being greatest in the districts most remote from the Bengal and Bombay coasts, *i.e.*, in Upper India. The rainfall of the month was in slight excess in Burma and Assam, and also in the Central Provinces, Berar and the Deccan.

The south-west monsoon trough of low pressure occupied a mean position, differing little from the normal in July and August, but was on the whole further south than usual.

The Bombay current was slightly weaker than usual in September, whilst the Bay current was abnormally steady and vigorous. The position of the trough of low pressure usually changes considerably during the month in consequence of the large pressure changes in Upper India terminating the south-west monsoon conditions in that area. It was, however, in September 1893 more southerly and easterly than usual. Three storms occurred during the month, which advanced along the position of the trough of low pressure at the time of their existence, and hence their paths differed considerably, the first two advancing by curved tracks through Central India and the Central Provinces to the South-East Punjab or the North-

Western Provinces, and the third along a north-north-westerly to northerly track into Bihar. The whole of Northern and Central India received abundant rain in September and the Peninsula normal rain.

The chief features of the rainfall of the period may be summarized as follows:—

- (1) Rainfall was in moderate to large excess over the whole of Northern and Central India (*i.e.*, to the north of the Satpuras), with the exception of the coast districts of Sind and Cutch. The excess increased (relatively to normal) on the whole northwards and westwards, and was hence greatest relatively to the normal (*i.e.*, measured as a percentage variation) in the Punjab and Rajputana. The following gives data:—

PROVINCE OR AREA.	RAINFALL DURING PERIOD, JUNE TO SEPTEMBER.			
	Actual, 1893.	Normal.	Variation from normal.	Percentage variation.
	"	"	"	"
Bengal	65.43	57.97	+7.46	+13
Chota Nagpur	51.03	43.23	+7.80	+18
Bihar	46.31	39.06	+7.25	+19
North-Western Provinces	38.45	32.91	+5.54	+17
Rajputana	23.47	18.44	+5.03	+35
Punjab	19.89	14.71	+5.18	+27
Central India	39.72	40.67	-0.95	-2
Central Provinces (North-eastern Districts).	51.02	43.87	+7.15	+16

- (2) Rainfall was in slight to moderate defect in the west coast districts except Kathiawar.

PROVINCE OR AREA.	RAINFALL DURING PERIOD, JUNE TO SEPTEMBER.		
	Actual, 1893.	Normal.	Variation from normal.
	"	"	"
Sind	3.33	4.49	-1.16
Kathiawar	29.58	28.64	+0.94
Konkan	98.35	106.12	-7.77
Malabar	88.55	102.05	-13.50

- (3) Rainfall was in slight defect in the north of the Peninsula (*i.e.*, in the western districts of the Central Provinces, Berar and Khandesh).

PROVINCE OR AREA.	RAINFALL DURING PERIOD, JUNE TO SEPTEMBER.			
	Actual 1893.	Normal.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Central Provinces (West)	34.64	39.96	-5.32	-13
Berar	27.40	34.65	-7.25	-21
Bombay (Deccan)	24.61	26.56	-1.95	-7

- (4) Rainfall was in moderate to large excess over the greater part of the South and Central Deccan and Southern India.

AREA.	RAINFALL DURING PERIOD, JUNE TO SEPTEMBER.			
	Actual, 1893.	Normal.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Hyderabad (North)	39'99	28'71	+ 11'28	+ 39
Ditto (South)	35'19	23'78	+ 11'41	+ 48
Madras (South Central)	11'36	12'20	- 0'84	- 7
Ditto East Coast (North)	32'20	25'57	+ 6'63	+ 26
Ditto ditto (ditto)a	66'50	47'17	+ 19'33	+ 41
Mysore	18'53	20'37	- 1'84	- 9

- (5) Rainfall was normal or in slight defect in Burma and Assam.

AREA.	RAINFALL DURING PERIOD, JUNE TO SEPTEMBER.			
	Actual, 1893.	Normal.	Variation from normal.	Percentage variation.
	Inches.	Inches.	Inches.	
Arakan	116'92	120'64	- 4'08	- 3
Pegu	53'84	65'86	+ 0'64	+ 1
Tenasserim	122'83	137'74	- 5'63	- 1
Bay Islands	48'33	69'02	- 10'81	- 16
Assam (Brahmaputra)	52'43	56'12	- 1'61	- 3

It is evident that the combination of an unusually strong south-east trades circulation and the absence of unfavourable conditions in India during the hot weather of April and May 1893 would account for the following features:—

- (1) The unusually early and strong temporary advances of southerly humid winds in April and May over the Bay area.
- (2) The early permanent establishment of the monsoon currents over the Indian seas and the coast districts of India in the beginning of June.
- (3) Their rapid extension over the Indian land area to the limits of the Punjab.
- (4) The unusual strength and steadiness of the monsoon currents.

The preceding has furnished some reasons for the assumption that the south-east trades in the Indian Ocean were stronger than usual during the monsoon period of 1893. If this be the case, the simplest explanation of the increased strength would be the prevalence of abnormal temperature and pressure conditions in the south of the Indian Ocean (and perhaps the Antarctic Ocean). According to newspaper reports the number of floating icebergs in the Antarctic Ocean was unusually great in 1893.

It has been frequently pointed out that the initial advances, temporary or permanent, are in the majority

of cases accompanied with actions which give rise to the formation of cyclonic storms in the Bay and the Arabian Sea. 1893 was no exception to this. For example, there were two well-marked advances of southerly humid winds in the Bay before the permanent advance. The first temporary advance in the last week of April originated a small cyclonic storm, which passed into Burma. The second, which was a much more powerful advance, initiated a small but severe cyclone in the north of the Bay in the fourth week of May. The permanent advance in the Bay during the second week of June gave rise to a cyclonic storm of moderate intensity. The permanent advance in the Arabian Sea in the first week of June was accompanied by a small cyclonic storm which, however, did not develop to the same extent that the storms in the Bay noted above did.

As cyclonic storms occur almost invariably in the Bay during the early strong advances of humid winds, it may hence be inferred that the onrush of the powerful humid current of the south-west monsoon contains within itself, and independently of external actions or conditions, the conditions for the origin and development of cyclonic storms, and the advance of the south-west monsoon in 1893 is a striking illustration of this feature.

Another interesting feature connected with the south-west monsoon currents in 1893 was the remarkable absence of cyclonic storms in the Bay between the middle of June and the end of August. It has been pointed out that these storms form most frequently during the periods known as breaks in the rains. The monsoon current is by no means a steady current or circulation. The strength of the winds and the rainfall occasionally go through large oscillatory changes or fluctuations. Cyclonic storms in the rains usually form when these oscillatory changes are large and during that phase of the oscillatory changes characterized by feeble monsoon winds and light rainfall in Bengal and Northern India. It is hence evident that their frequency of occurrence is to some extent a measure of the unsteadiness and variability of the strength of the monsoon currents in the Bay and Northern India. Their remarkable absence in June, July and August 1893 is hence an additional indication and confirmation of the unusual strength and steadiness of the monsoon currents of 1893.

The distribution of the south-west monsoon rainfall in 1893 and its variations from the normal were related in the first place to the strength, extension and steadiness of the monsoon currents, and in the second place to the larger variations in their extension (*i.e.*, the area of their prevalence in India). Thus, the deficient rainfall in Assam and Burma (more especially in June and July) was due to the diversion of the current to a larger extent than usual from these areas, and its abnormally strong set towards the Gangetic plain and Punjab. A like explanation holds

for the deficient rainfall in the west coast districts where the monsoon rainfall is, as a rule, in defect when the precipitation in Upper India is largely in excess. The slight deficiency in the south and central districts of the Central Provinces, Berar and Khandesh was owing to the remarkable absence of cyclonic storms in July and August.

The following gives a summary of the variation data of the elements of observation for the period :—

METEOROLOGICAL PROVINCE.	MEAN VARIATION FROM NORMAL DURING SOUTH-WEST MONSOON PERIOD, JUNE TO OCTOBER 1893, OF							
	Mean pressure.	Mean maximum temperature.	Mean minimum temperature.	Mean temperature.	Mean aqueous vapour pressure.	Mean humidity.	Mean cloud amount.	TOTAL RAIN-FALL.
Burma Coast and Bay Islands.	Inches. —'006	° 0	° +0'1	° 0	Inches. + '001	0	+ 1'1	Inches. —9'56
Burma Inland.	+ '001	—0'7	—0'1	—0'4	?	?	?	+5'38
Assam.	+ '011	—1'4	—0'6	—1'0	—'004	+ 1	0	+10'13
Bengal and Orissa.	+ '008	—1'1	0	—0'6	—'012	—1	+0'7	+5'92
Gangetic Plain and Chota Nagpur.	+ '003	—2'2	—0'8	—1'5	+ '005	+ 3	+0'8	+9'40
Upper Sub-Himalayas.	+ '001	—3'1	—1'0	—2'1	+ '017	+ 5	+0'6	+4'04
Indus Valley and North-West Rajputana.	0	—0'7	—0'4	—0'6	+ '017	+ 2	+0'1	+2'77
East Rajputana, Central India and Gujarat.	+ '005	—1'7	—1'2	—1'4	+ '011	+ 4	+0'5	+2'24
Deccan.	+ '002	—1'4	—0'8	—1'1	+ '003	+ 2	+0'3	+2'30
West Coast.	—'005	—0'2	+0'1	—0'1	—'016	—1	—0'2	—18'21
South India.	—'004	—0'9	—0'4	—0'7	—'005	0	+0'3	—0'97

The preceding data show that the rainfall was more or less in excess in all the meteorological divisions, with the exception of Lower Burma, the West coast districts and South India, and, as might be expected from the increased rainfall, the amount of cloud was in excess, the air was damper than usual, and temperature (more especially the day temperature) below the normal over the whole of India with some unimportant exceptions. The most noteworthy feature was that the mean pressure of the whole period for the Indian area differed from the normal by only '002" and the range of variation between the different provinces was less than '02" (*i.e.*, from '006" in Lower Burma to + '011" in Assam). It is a striking illustration of the very small seasonal pressure variations, which accompany very large abnormal features in the rainfall, temperature and humidity conditions of the period and of the effect of the south-west monsoon actions in equalizing the pressure conditions and smoothing away the pressure irregularities introduced during the preceding hot weather.

The Retreating South-West Monsoon period (October to December 1893).—The conditions of this period were as interesting as those of the three preceding periods of the year. The progress of the changes

was so far, as can be judged, normal, but the changes and their effects were more marked than usual.

It may be noted in connection with the problems which the massive meteorological changes in India offer for consideration, that they indicate the necessity for a more careful analysis of the relation between changes of pressure and the other elements of meteorological observation than has yet been made. Relations more or less exact, stated as mathematical formulæ, have undoubtedly been obtained, but they merely state the relations between the pressure gradients and the velocity of the air motion under given conditions. The time element has been ignored (on account of its difficulty), and the progress of the changes of pressure with time in their relation to the other meteorological changes affecting pressure has not yet been expressed in mathematical form.

In the absence of such knowledge, statement of time changes is necessarily either empirical or speculative.

In one class, at least, of meteorological phenomena, *viz.*, cyclonic storms, the changes in progress are mainly due to changes and actions in the atmosphere over the area of observation. In other cases the changes in and over a given area are due chiefly to meteorological actions in progress outside of that area, and it is hence necessary to study the meteorological conditions of neighbouring and distant regions, in order to ascertain how far they explain changes in any given area, more especially when the consideration of the observations in that area fail to disclose an adequate cause for the observed changes, as it is evidently possible they may depend upon external changes and actions.

It has, for example, been pointed out in the annual reviews and reports of the department that the establishment of the monsoon in India is preceded for some time by a rapid increase of temperature and fall of pressure in Northern India, and that this is a necessary antecedent, but is not the predominant factor determining either the time or character of the advance of the great monsoon currents over the Indian seas into India. The establishment is, as a matter of fact, not directly related to the duration or intensity of the hot weather temperature and pressure conditions in Northern India in April and May. The so-called furnace theory may explain the fall of pressure in Northern India in these months, but does not adequately explain the peculiar character of the massive advance of the monsoon currents from the equatorial region towards India and the very varying features of the establishment of the south-west monsoon in India. It is certain that conditions and actions in the equatorial belt and the south-east trades region of the Indian Ocean are at least as important as the conditions in India, and it is probable that they may be probably the chief factors.

The following paragraphs give reasons for the inference that atmospheric conditions and actions external to

India are the chief factors in determining the time and character of the retreat of the south-west monsoon current.

The withdrawal of the monsoon humid currents from North-Western India is usually a comparatively rapid process. It accompanies a considerable increase of pressure in countries to the north-west of India, including Afghanistan, Baluchistan and Persia. This change extends from the north-west frontier of India across the Punjab and Sind, and may be described as the advance of a high pressure wave into Rajputana and the Central India plateau. An important effect of the advance of this high pressure wave is to change the mean position of the south-west monsoon trough of low pressure which, instead of running in a nearly straight direction from Orissa to Upper Sind, curves in the Central Provinces or Central India into the North-Western Provinces or Bihar. Associated with this change is the tendency for cyclonic storms in September to advance for some distance in a west-north-westerly direction across Orissa and the head of the Peninsula, and then to recurve and pass northwards into the South-East Punjab, the North-Western Provinces or Bihar. The continued advance of the high or increasing pressure area south-eastwards tends to displace the trough towards Bengal, and hence in the beginning of October it is frequently represented by a very shallow low pressure area lying over Bengal or Burma or the north of the Bay. Burma and Bengal usually continue to receive moderate rain during the last half of September and the beginning of October, and it is probably mainly due to these changes in the extension of the Bay current that September is the month of heaviest rainfall at many stations in Central and Upper Burma. A rapid increase of pressure, however, apparently commences in South-Western China in the beginning or middle of October, and extends southwards as a wave of high pressure. This causes a second large and important displacement of the low pressure area or trough and of the extension of the monsoon current in the Bay. The trough of low pressure (or its representative, at this time, the very shallow depression in the Bay) shifts in position and passes southwards and westwards across the Bay, and then extends across the centre of the Bay towards the Madras coast. The direction of its axis or longest diameter, which tends to run north and south in the beginning of October, usually lies after that change in an east and west direction across the Bay. At the same time the humid monsoon current is diverted towards the Madras coast and initiates the so-called north-east monsoon rains. The low pressure area or trough varies in position and also in depth during the next two months, but tends to be displaced southwards and to pass out of the Bay area and be absorbed into the equatorial permanent low pressure belt. That change usually occurs in the third or fourth week of December, but sometimes takes place as early as the second or third week of November. It marks the termination of the retreating south-west monsoon rains in Southern India.

The character, intensity and duration of the retreating south-west monsoon rains in the Peninsula hence appear to be largely dependent upon the intensity of two high pressure waves. The first in time advances across the north-west frontier in the middle or end of September, and the other across the north-east frontier and Burma during the first and second weeks of October. (The advance of a high pressure wave is necessarily associated with certain well-defined conditions and changes of temperature, humidity and air motion which need not be further referred to at present.) When the Persian and Upper India high pressure wave is much stronger than usual and advances into the Deccan earlier than usual, it diverts the low pressure area and the monsoon current away from that area, and hence gives rise to a partial or complete failure of the retreating south-west monsoon rains in the Deccan and North Madras. If, on the other hand, the South China and Burma wave of high pressure sets in earlier and is more intense, and hence advances more rapidly southwards than usual, it displaces the humid south-west monsoon current from the Bay earlier than usual, and true north-east monsoon winds extend over the whole Bay in the month of November or early in December.

The progression of changes accompanying the retreat of the south-west monsoon in 1893 was in marked agreement with the above.

It withdrew from North-Western India in the fourth week of September after the second storm of that month. That storm marched west-north-westwards from the Orissa coast to Mount Abu and then recurved to north and broke up at the foot of the hills in the South-East Punjab. A storm in the last week of the month advanced by a curved path from the Orissa coast through the Sambalpur district to the western districts of North Bihar. As these two storms advanced along the trough of low pressure, their paths illustrate very clearly the change which occurred in its position during the last fortnight of September.

In the beginning of October a very shallow depression lay over East Bengal, Burma and the north-east of the Bay. It slowly shifted its position southwards until the 9th. During this period, and for some days afterwards Burma received steady, moderate and favourable rain. Pressure began to rise in Burma relatively to the Indian area, and the depression was displaced westwards across the Bay. It did not develop into a cyclonic storm during its transfer across the Bay. It lay off the Coromandel coast on the 10th, and determined a heavy burst of rain for some days to the north and centre of the Peninsula. During this period the depression extended westwards into the North Deccan, and (as occasionally happens in Bengal during the south-west monsoon when strong humid winds are blowing into that area) the very shallow

depression in the Deccan intensified, and the cyclonic storm thus formed marched northwards into Oudh where it broke up. The local and temporary increase of pressure in the Peninsula which followed the breaking up of this storm, modified the pressure conditions considerably, and the axis of the belt of low pressure again ran north and south along the east or centre of the Bay. The humid current was stronger than usual and gave rise during the remainder of the month of October to two storms which advanced northwards, the first to East Bengal and Silchar, and the second (following, as usual when two storms occur in the Bay in rapid succession, a more southerly or easterly track) advanced to the South Arakan coast and Central Burma.

The large increase of pressure in Bengal and Burma relative to the Peninsula, which accompanied and followed the filling up of these two storms, gave approximately normal pressure conditions in the Bay and the Peninsula in November. A series of depressions, varying very greatly in intensity, formed in the centre and south-west of the Bay during that month. All of these depressions advanced to the Madras coast districts and determined excessively heavy rain to nearly the whole of Madras and the Deccan, and moderately heavy rain to Mysore.

The most remarkable feature of the month of November on the whole was the frequent extension of the humid current over the whole of the Peninsula, including Berar and the Central Provinces, and in consequence the Central Provinces and Hyderabad received abnormally heavy rain in the month.

Meanwhile pressure was increasing locally in Burma and Assam, and unusually cool and strong northerly winds prevailed in that area. This high pressure wave extended its influence rapidly over the Bay in the last week of November and first week of December, and displaced the humid winds southwards across the entrance to the Bay. Hence, true north-east monsoon winds prevailed over the whole of the Bay and the entrance to the Bay as far south as Lat. 4° N. from the first week of December to the end of the month. A narrow belt along the South Coromandel coast received occasional showers, but these were received during the periods when the north-east winds in the centre and south of the Bay were, from one action or another, blowing most strongly. This local rain was hence due to intensified north-east monsoon winds. The peculiar pressure conditions in Burma in November 1893 were similar to those which obtained in November 1892, and in both cases they were followed by the prematurely early withdrawal of humid winds from the Bay and the establishment of true north-east monsoon winds in the south of the Bay and the Madras Presidency, and hence by an almost complete absence of rain in Southern India in December except in a narrow belt along the South Coromandel coast and in East Ceylon.

The following table giving the pressure for anomalies of the eleven meteorological provinces in India for the months of October, November and December, illustrates the more important pressure conditions of the period:—

METEOROLOGICAL PROVINCE.	PRESSURE ANOMALY.			
	Septem-ber.	Octo-ber.	Novem-ber.	Decem-ber.
	"	"	"	"
Burma Coast and Bay Islands	—'001	—'004	+ '018	+ '011
Burma Inland	—'002	+ '013	+ '026	?
Assam	+ '010	+ '006	+ '029	+ '036
Bengal and Orissa	—'012	—'002	+ '019	+ '007
Gangetic plain and Chota Nagpur	—'013	—'005	+ '007	—'006
Upper Sub-Himalayas	—'002	—'003	+ '015	—'006
Indus Valley and North-West Raj-putana	—'008	+ '004	+ '005	—'027
East Rajputana, Central India and Gujarat	—'002	+ '008	—'007	—'005
Deccan	+ '003	—'001	—'008	+ '004
West Coast	+ '017	+ '002	—'030	+ '001
South India	+ '014	—'007	—'021	+ '003

Pressure was in slight defect in the Indian area in October and in moderate to largish excess in November and December. These general variations, however, extend over a much larger area than India, and probably include the greater part of Southern and Central Asia and the northern half of the Indian Ocean, including the Bay of Bengal and Arabian sea, and have little to do with the local weather conditions in India. The pressure anomalies in the preceding table show that there was a very slight local excess of pressure in North-Western India and Baluchistan in October or the high pressure wave was of normal character. Pressure anomalies were throughout negative over the whole of the Peninsula during the months of October and November, and hence there was a slightly feeble tendency than usual for the high pressure wave to advance across Central India into the Deccan. Hence, so far as the high pressure conditions in North-Western India were concerned, they had slightly less influence than usual in the Peninsula, and conditions were consequently favourable for early and normal or abundant retreating south-west monsoon rains in Madras. The data also show that there was an abnormal and local excess of pressure in Assam and Burma in November, and that the high pressure conditions in that area intensified and extended across the Andamans and over the Bay in the beginning of December. The extension of these high pressure conditions south-westwards from Burma was hence apparently the most important factor in determining the early establishment of true north-east monsoon winds over the whole Bay area in the beginning of December and the early termination of the retreating south-west monsoon rains in that month in Southern India.

In the preceding remarks have been described the chief features of the meteorology of the retreating south-west

monsoon period and the relations between these features and the conditions in Southern Asia which appear to determine these features.

The following gives variation data of ten meteorological provinces for the period November and December 1893:—

METEOROLOGICAL PROVINCE.	VARIATION FROM NORMAL DURING THE PERIOD NOVEMBER AND DECEMBER 1893 OF						
	Mean pressure.	Mean maximum temperature.	Mean minimum temperature.	Mean aqueous vapour pressure.	Mean humidity.	Mean cloud.	Variation from normal of average actual rainfall.
Burma Coast and Bay Islands . . .	"	o	o	"			Inches.
Assam . . .	+ '049	—1'6	—2'6	—'076	—5	—0'6	—4'46
Bengal and Orissa . . .	+ '067	—1'2	—1'3	—'023	—1	—1'0	—0'83
Gangetic Plain and Chota Nagpur . . .	+ '047	—0'4	+ 0'7	o	—2	+ 0'2	—0'90
Upper Sub-Himalayas . . .	+ '035	—0'9	+ 2'1	+ '042	+ 5	+ 0'4	—0'16
Indus Valley and North-West Rajputana . . .	+ '039	—1'1	+ 1'7	+ '020	+ 5	+ 0'8	—0'37
East Rajputana, Central India and Gujarat . . .	+ '028	—1'0	+ 3'2	+ '057	+ 9	+ 1'2	+ 1'27
Deccan . . .	+ '032	—0'4	+ 2'6	+ '059	+ 9	+ 0'8	+ 0'46
West Coast . . .	+ '020	+ 0'9	+ 0'6	—'023	—4	+ 0'6	+ 0'54
South India . . .	+ '025	—0'9	—0'2	+ '019	+ 3	+ 0'5	+ 4'89

The chief features of the period were as follows:—

1st.—General excess of pressure, greatest in amount in Burma and Assam and least in the Peninsula and Upper India.

2nd.—Increased amount of cloud over the whole of the Indian area except Assam and Burma.

3rd.—Increased humidity over nearly the whole Indian area, with the exception of Assam and Burma, where both the absolute and relative humidities were below the normal to a moderate extent.

4th.—Increased rainfall over North-Western India and the Peninsula. The only area in which there was a considerable deficiency was Burma, where the rainfall of November was considerably below the normal.

5th.—Temperature was in slight to moderate excess (due to considerably increased night temperature) over the whole area except Burma and Assam, where both the day and night temperatures were in slight to moderate defect.

It is evident that these abnormal features are directly related to—

1st.—The prevalence of stronger humid currents in the Bay during the months of October and November than usual.

2nd.—The establishment of strongly marked anticyclonic or high pressure conditions in Burma and Assam in November.

The first feature was the continuation of the most important feature of the previous south-west monsoon period. The south-west monsoon currents, more especially the Bay current, had been throughout unusually strong and steady and had given more abundant rain than usual, and these features were hence persistent during the period of its retreat from Northern India and the Bay area.

The abnormal conditions established in Burma and Assam were apparently the extension of conditions in the large plateau area to the north. Similar conditions prevailed in the corresponding period of 1892. The following gives a comparison of the antecedent conditions in Burma and Assam during the two years:—

ASSAM.

VARIATION FROM NORMAL OF	1892.			1893.		
	August.	September.	October.	August.	September.	October.
Mean monthly pressure.	+ '031	—'029	—'021	+ '010	—'012	—'005
Mean daily temperature.	— 1'2	+ 1'1	— 0'6	— 1'0	— 0'5	— 0'4
Mean humidity .	+ 2	— 2	o	+ 2	— 2	+ 2
Mean cloud .	+ 0'5	— 0'2	— 0'5	+ 0'1	— 0'6	+ 0'2
Average actual rainfall.	+ 7'76	—1'42	+ 2'19	+ 3'49	—5'85	+ 1'97

BURMA.

VARIATION FROM NORMAL OF	1892.			1893.		
	August.	September.	October.	August.	September.	October.
Mean monthly pressure.	+ '021	—'016	—'011	—'014	—'023	—'012
Mean daily temperature.	+ 0'3	— 0'5	— 0'4	+ 0'4	— 0'6	—
Mean humidity .	— 3	— 1	— 1	— 1	+ 1	+
Mean cloud .	+ 0'2	+ 0'8	— 0'2	+ 0'6	+ 1'1	+
Average actual rainfall.	—6'43	+ 0'81	+ 0'26	—0'47	+ 2'09	—

ASSAM.

VARIATION FROM NORMAL OF	1892.		1893.	
	Novem-ber.	Decem-ber.	Novem-ber.	Decem-ber.
Mean monthly pressure . . .	-.039	+.030	+.068	+.065
Mean daily temperature . . .	- 07	- 05	0	- 24
Mean humidity	- 1	0	+ 2	- 3
Mean cloud	- 08	- 02	+ 01	- 20
Average actual rainfall . . .	+129	-019	-040	-043

BURMA.

VARIATION FROM NORMAL OF	1892.		1893.	
	Novem-ber.	Decem-ber.	Novem-ber.	Decem-ber.
Mean monthly pressure . . .	-.035	+.045	+.058	+.040
Mean daily temperature . . .	0	- 24	- 09	- 35
Mean humidity	0	- 5	- 2	- 6
Mean cloud	+ 04	- 07	- 11	- 10
Average actual rainfall . . .	-160	-036	-268	-031

The preceding data hence show fully the character of the important changes in progress in Assam and Burma in November and their influence on the meteorology of Southern India in December.

They indicate that north-east winds set in over the Eastern Peninsula and the Andaman Sea in the latter half of November. The south-west winds in the south of the Bay gave way rapidly in the first week of December and north-east monsoon winds were established over the whole of the Bay before the end of that week.

The indications in Burma during November of the existence of an abnormally cool and dry north-east air current were excessive pressure, great dryness of the air, deficient

rainfall and temperature (more especially the night temperature) largely below the normal. The reduction of humidity and temperature was on the whole most marked in Lower Burma in November. These features extended westwards to the Andaman Islands, as represented by Port Blair, and to Southern India in December.

As stated in the annual review for 1892, the simplest and most satisfactory explanation of the origin of these conditions appears to be that there was a stronger flow of land winds down the river valleys of Burma and Siam, and probably also of Assam, due to causes in operation in Central Asia (China and Thibet), the character of which can only be surmised in the absence of all information relating to that area.

The temperature, cloud, humidity and other conditions in India of the retreating south-west monsoon period were hence largely determined by the strongly marked north-east monsoon conditions in Burma and North-Eastern India. The conditions at the end of the year in India were in no way remarkable. There was a slight to moderate local deficiency of pressure in North-Western and Central India and a slight deficiency at the western Himalayas hill stations relative to the neighbouring plain stations, but the amounts were small and only significant when taken into consideration in connection with the character of the preceding south-west monsoon.

Weather was unusually fine in Northern India during the last months of the year; but there was very slight indication that the cold weather would be more disturbed than usual in Upper India. These indications will, however, be dealt with in the annual summary for 1894. The following table gives a tabular summary of the chief features of the meteorological data of the year 1893 for the eleven meteorological provinces of India:—

PROVINCE.	Bar. variation from normal.	Mean maximum.	Variation from normal.	Mean minimum.	Variation from normal.	Mean daily temperature.	Variation from normal.	Mean daily range.	Absolute range during year.	Mean monthly absolute range.	Rainfall.	Normal rainfall.	Variation from normal.
	"	°	°	°	°	°	°	°	°	°	Inches.	Inches.	Inches
Burma Coast and Bay Islands . . .	-.003	86.6	-1.0	72.5	-0.7	79.6	-0.8	14.1	39.7	22.0	136.03	136.88	-0.86
Burma Inland	+.012	88.8	-1.7	68.4	-0.8	78.7	-1.3	20.4	61.2	31.4	55.46	54.91	+0.55
Assam	+.015	81.9	-1.8	66.2	-0.5	74.4	-1.0	16.3	56.4	27.5	107.48	101.50	+5.98
Bengal and Orissa	+.009	83.8	-2.5	69.1	-0.5	76.8	-1.6	15.1	55.0	26.8	89.99	70.56	+18.87
Gangetic plain and Chota Nagpur . . .	+.007	85.0	-3.2	66.1	-0.6	75.5	-1.9	18.9	66.8	32.1	58.36	44.83	+13.53
Upper Sub-Himalayas	+.007	83.1	-4.1	61.8	-0.7	72.4	-2.4	21.1	73.4	36.1	48.06	38.80	+9.26
Indus Valley and North-Western Rajputana . . .	0	89.8	-1.5	64.1	+0.1	76.6	-0.7	25.2	78.9	41.0	15.86	9.36	+5.48
East Rajputana, Central India and Gujarat . . .	+.006	87.9	-2.5	66.3	-0.5	77.1	-1.5	21.6	68.6	35.1	34.46	32.27	+4.87
Deccan	+.004	87.6	-2.5	66.5	-0.6	77.1	-1.6	21.2	61.2	33.2	49.93	40.42	+7.57
West Coast	-.004	85.5	-0.4	73.6	-0.1	79.6	-0.3	12.0	29.9	19.1	93.85	111.02	-12.33
South India	-.004	88.3	-0.9	71.3	0	79.8	-0.5	17.0	44.4	26.4	46.89	43.72	+5.42
Mean of whole India from Table I	+.004	86.2	-2.0	67.8	-0.4	77.1	-1.2	18.4	57.8	30.1	66.94	62.21	+5.88
Mean of whole India from Table II	+.001	85.8	-2.4	67.4	-0.8	75.7	-1.2	18.4	57.3	...	...	...	...

The preceding data established that on the average of the whole year pressure was practically normal and that temperature was in considerable defect. The deficiency averaged 1.33 for the whole of India and is the greatest annual deficiency recorded during the past 20 years.

The year was more humid and cloudy than usual in all divisions and the rainfall more or less considerably in

excess. The excess averaged 9.07 inches for the whole of India and Burma and is the largest recorded during the past 30 years. It was greatest in Bengal, Bihar, the North-Western Provinces, the Punjab, Rajputana, the Central Provinces and Hyderabad.

The year was hence, from a meteorological point of view, the most remarkable during the past 30 years.

EXPLANATION OF PLATES.

PLATE I.—A chart of India showing the 11 meteorological provinces and 51 districts of India.

PLATE II.—A chart of India showing the variation of the rainfall of the months of January and February 1893 from the normal. This chart and the three following charts have been prepared to illustrate the data given in Table XIV. These charts are drawn up in the same manner as the rainfall chart (Plate V) in the Monthly Weather Reviews of the year 1893.

PLATE III.—A chart of India showing the variation of the rainfall of the month of March to May 1893 from the normal.

PLATE IV.—A chart of India showing the variation of the rainfall of the months of June to October 1893 from the normal.

PLATE V.—A chart of India showing the variation of the rainfall of the months of November and December 1893 from the normal.

PLATE VI.—Chart showing the tracks of the more important cyclonic storms of 1893 in the Indian area during the south-west monsoon, a brief summary of which is given on pages 540-543.

**Explanation.**

The name of the districts can be at once ascertained by referring to the following list to the
• number given near the right hand boundary of each district in small slanting figures.

1. Tenasserim	14. Beha (South)	27. Punjab (West)	40. Gujarat
2. Lower Burma	15. Do. (North)	28. Malabar	41. Kathiawar
3. Central do.	16. North Western Provinces (East)	29. Madras (South Central)	42. Sind
4. Upper do.	17. Oudh (South)	30. Coorg	43. Central India (East)
5. Arakan	18. Do. (North)	31. Mysore	44. Rajputana (East) Central India (West)
6. Eastern Bengal	19. North Western Provinces (Central)	32. Konkan	45. Rajputana (West)
7. Assam (Surma)	20. Do. do. (West)	33. Bombay Deccan	46. East Coast (North)
8. Do. (Brahmaputra)	21. Do. do. (Submontane)	34. Hyderabad (North)	46(a). Do. do. (a)
9. Deltaic Bengal	22. Punjab (South)	35. Khandeish	47. Hyderabad (South)
10. Central do.	23. Do. (Central)	36. Berar	48. Madras (Central)
11. North do.	24. Do. (Submontane)	37. Central Provinces (West)	49. East Coast (Central)
12. Orissa	25. Do. (Hill Districts)	38. Do. (Central)	50. East Coast (South)
13. Chota Nagpore	26. Do. (North West)	39. Do. (East)	51. Madras (South)

CHART
OF
INDIA
SHEWING THE VARIATION OF THE RAINFALL
OF THE MONTH OF JANY. & FEBY. 1893
FROM THE NORMAL.

Scale 1 inch = 256 Miles



Explanation.

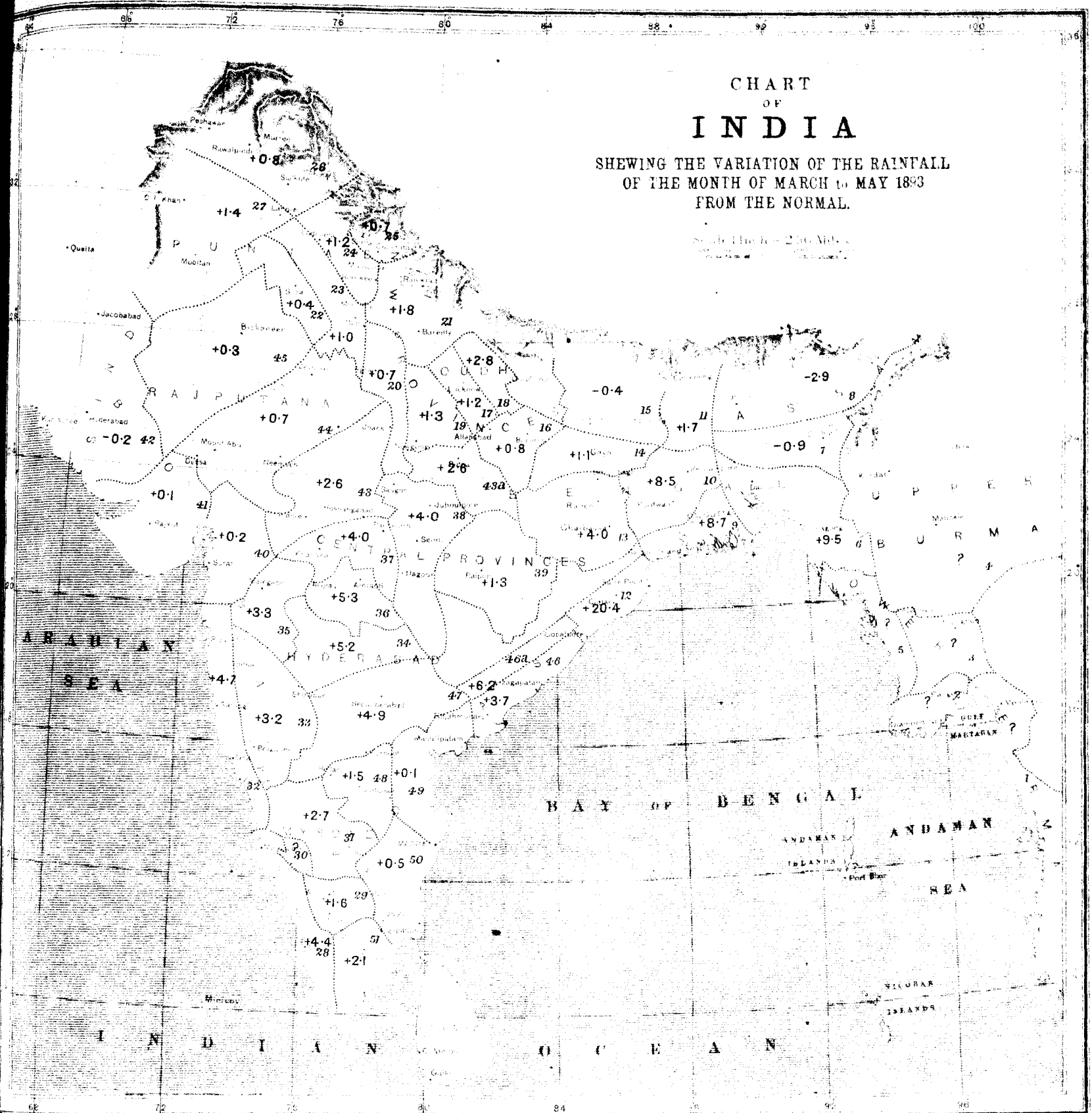
The Chart gives the variations of the rainfall of the month (to tenths of an inch) from the normal over the whole of India and Burma with the exception of Upper Burma, for which rainfall data have not been obtained for a sufficient number of years to furnish reliable and useful means. The country is divided into 51 areas, over each of which the meteorological conditions are fairly uniform, and the staple crops similar in character; and the means (both actual and normal for the month) have been calculated, and the numbers given in the centre of each division (usually with a + or - sign attached) give the difference between the actual and normal mean rainfall of the district of the month. A plus sign indicates that the rainfall was in excess, and a negative sign that it was in defect by the amounts indicated by the numbers to which the signs are attached. The name of the districts can be at once ascertained by referring in the following list to the number given near the right hand boundary of each district in small slanting figures.

1. Tenasserim	15. Behar (North)	29. Madras (South Central)	43. Central India (East)
2. Lower Burma	16. North Western Provinces (East)	30. Coorg	43(a) Do. do. (a)
3. Central do.	17. Oudh (South)	31. Mysore	44. Rajputana (East Central India (West))
4. Upper do.	18. Do. (North)	32. Konkan	45. Rajputana (West)
5. Arakan	19. North Western Provinces (Central)	33. Bombay Deccan	46. East Coast (North)
6. Eastern Bengal	20. Do. do (West)	34. Hyderabad (North)	46(a) Do. do. (a)
7. Assam (Surma)	21. Do. do (Submontane)	35. Khandeish	47. Hyderabad (South)
8. Do. (Brahmaputra)	22. Punjab (South)	36. Berar	48. Madras (Central)
9. Deltaic Bengal	23. Do. (Central)	37. Central Provinces (West)	49. East Coast (Central)
10. Central do.	24. Do. (Submontane)	38. Do. (Central)	50. East Coast (South)
11. North do.	25. Do. (Hill Districts)	39. Do. (East)	51. Madras (South)
12. Orissa	26. Do. (North West)	40. Gujarat	
13. Chota Nagpore	27. Do. (West)	41. Kathiawar	
14. Behar (South)	28. Malabar	42. Sind	

CHART OF INDIA

SHEWING THE VARIATION OF THE RAINFALL
OF THE MONTH OF MARCH TO MAY 1893
FROM THE NORMAL.

Scale 1 inch = 200 Miles.



Explanation.

The Chart gives the variations of the rainfall of the month (to tenths of an inch) from the normal over the whole of India and Burma with the exception of Upper Burma, for which rainfall data have not been obtained for a sufficient number of years to furnish reliable and useful means. The country is divided into 51 areas, over each of which the meteorological conditions are fairly uniform, and the staple crops similar in character, and the means (both actual and normal for the month) have been calculated, and the numbers given in the centre of each division (usually with a + or - sign attached) give the difference between the actual and normal mean rainfall of the district of the month. A plus sign indicates that the rainfall was in excess, and a negative sign that it was in defect by the amounts indicated by the numbers to which the signs are attached. The name of the districts can be at once ascertained by referring in the following list to the number given near the right hand boundary of each district in small slanting figures.

1. Tenasserim	15. Behar (North)	29. Madras (South Central)	43. Central India (East)
2. Lower Burma	16. North Western Provinces (East)	30. Coorg	43/a. Do. do. (a)
3. Central do.	17. Oudh (South)	31. Mysore	44. Rajputana (East, Central India (West))
4. Upper do.	18. Do (North)	32. Konkan	45. Rajputana (West)
5. Arakan	19. North Western Provinces (Central)	33. Bombay Decan	46. East Coast (North)
6. Eastern Bengal	20. Do. do. (West)	34. Hyderabad (North)	46/a. Do. do. (a)
7. Assam (Surma)	21. Do. do. (Submontane)	35. Khandeish	47. Hyderabad (South)
8. Do. (Brahmaputra)	22. Punjab (South)	36. Berar	48. Madras (Central)
9. Deltaic Bengal	23. Do. (Central)	37. Central Provinces (West)	49. East Coast (Central)
10. Central do.	24. Do. (Submontane)	38. Do. (Central)	50. East Coast (South)
11. North do.	25. Do. (Hill Districts)	39. Do. (East)	51. Madras (South)
12. Orissa	26. Do (North West)	40. Gujarat	
13. Chota Nagpore	27. Do. (West)	41. Kathiawar	
14. Behar (South)	28. Malabar	42. Sind	

CHART OF INDIA

SHewing THE VARIATION OF THE RAINFALL
OF THE MONTH OF JUNE to OCT. 1893
FROM THE NORMAL.

Scale 1 inch = 256 Miles



Explanation.

The Chart gives the variations of the rainfall of the month (to tenths of an inch) from the normal over the whole of India and Burma with the exception of Upper Burma, for which rainfall data have not been obtained for a sufficient number of years to furnish reliable and useful means. The country is divided into 51 areas, over each of which the meteorological conditions are fairly uniform, and the staple crops similar in character; and the means (both actual and normal for the month) have been calculated, and the numbers given in the centre of each division (usually with a + or - sign attached) give the difference between the actual and normal mean rainfall of the district of the month. A plus sign indicates that the rainfall was in excess, and a negative sign that it was in defect by the amounts indicated by the numbers to which the signs are attached. The name of the districts can be at once ascertained by referring in the following list to the number given near the right hand boundary of each district in small slanting figures.

1. Tenasserim	15. Behar (North)	29. Madras (South Central)	42. Central India (East)
2. Lower Burma	16. North Western Provinces (East)	30. Coorg	43. Do. do. (n)
3. Central do.	17. Oudh (South)	31. Mysore	44. Rajputana (East Central India (West)
4. Upper do.	18. Do. (North)	32. Konkan	45. Rajputana (West)
5. Arakan	19. North Western Provinces (Central)	33. Bombay Decan	46. East Coast (North)
6. Eastern Bengal	20. Do. do. (West)	34. Hyderabad (North)	46(a). Do. do. (a)
7. Assam (Surma)	21. Do. do. (Submontane)	35. Khandeish	47. Hyderabad (South)
8. Do. (Brahmaputra)	22. Punjab (South)	36. Berar	48. Madras (Central)
9. Deltaic Bengal	23. Do. (Central)	37. Central Provinces (West)	49. East Coast (Central)
10. Central do.	24. Do. (Submontane)	38. Do. do. (Central)	50. East Coast (South)
11. North do.	25. Do. (Hill Districts)	39. Do. do. (East)	51. Madras (South)
12. Orissa	26. Do. (North West)	40. Gujarat	
13. Chota Nagpore	27. Do. (West)	41. Kathiawar	
14. Behar (South)	28. Malabar	42. Sind	



Explanation.

The Chart gives the variations of the rainfall of the month (in tenths of an inch) from the normal over the whole of India and Burma with the exception of Upper Burma, for which rainfall data have not been obtained for a sufficient number of years to furnish reliable and useful means. The country is divided into 51 areas, over each of which the meteorological conditions are fairly uniform, and the staple crops similar in character; and the means (both actual and normal for the month) have been calculated, and the numbers given in the centre of each division (usually with a + or - sign attached) give the difference between the actual and normal mean rainfall of the district of the month. A plus sign indicates that the rainfall was in excess, and a negative sign that it was in defect by the amounts indicated by the numbers to which the signs are attached. The name of the districts can be ascertained by referring in the following list to the number given near the right hand boundary of each district in small slanting figures.

1. Transganga	15. Behar (North)	29. Madras (South Central)	43. Ganjam (East)
2. Lower Burma	16. North Western Provinces (East)	30. " " "	43(a). Do. do. (a)
3. Central do.	17. Oudh (South)	31. Mysore	44. Rajputana (East Central India)
4. Upper do.	18. Do. (North)	32. Korkan	45. Rajputana (West)
5. Arakan	19. North Western Provinces (Central)	33. Bombay Deccan	46. East Coast (North)
6. Eastern Bengal	20. Do. do. (West)	34. Hyderabad (North)	46(a). Do. do. (a)
7. Assam (Sumat)	21. Do. do. (Submontane)	35. Khandesh	47. Hyderabad (South)
8. Do. (Brahmaputra)	22. Punjab (South)	36. Berar	48. Madras (Central)
9. Deltaic Bengal	23. Do. (Central)	37. Central Provinces (West)	49. East Coast (Central)
10. Central do.	24. Do. (Submontane)	38. Do. (Central)	50. East Coast (South)
11. North do.	25. Do. (Hill Districts)	39. Do. (East)	51. Madras (South)
12. Orissa	26. Do. (North West)	40. Gujarat	
13. Chota Nagpore	27. Do. (West)	41. Kathiawar	
14. Behar (South)	28. Malabar	42. Sind	



Table
Abstract of Observations taken at 8 A.M.

METEOROLOGICAL PROVINCE OR DISTRICT.	STATION.	Elevation of bar-ometer above sea-level in feet.	PRESSURE, 8 A.M., IN INCHES.								TEMPERATURE OF AIR.											
			Mean actual pres- sure (reduced to 32° of year.	Variation from normal.	Mean pressure of year reduced to sea-level and to constant gravity 45° Lat.	Highest pressure recorded during year.	Lowest pressure recorded during year.	Absolute range during year.	Mean monthly range of pres- sure.	Mean of 8 A.M. of year.	Mean maximum of year.	Variation from normal of year.	Mean minimum of year.	Variation from normal of year.	Mean daily tem- perature of year.	Variation from normal of year.	Mean daily range of temperature.	Highest temper- ature observed during year.	Lowest temper- ature observed during year.	Absolute range during year.	Mean monthly absolute range.	
I.—Burma Coast and Bay Islands.			—003	86.6	—1.0	72.5	—0.7	79.6	—0.8	14.1	39.7	22.0
BAY ISLANDS .	Port Blair . . .	61	29.837	P	29.829	30.015	29.589	.426	.196	80.0	86.3	P	76.8	P	81.6	P	9.5	93.7	68.5	25.0	16.6	
	Camorta . . .	P	29.903	P	P	30.05E	29.716	.339	.159	80.4	85.1	P	76.3	P	80.7	P	8.8	89.7	68.9	20.8	14.9	
TENASSERIM .	Mergui . . .	96	29.841	P	29.870	30.003	29.690	.313	.163	78.0	86.8	P	P	P	P	P	9.6	94.6	43.5	51.1	P	
	Tavoy . . .	26	29.916	P	29.873	30.101	29.765	.336	.165	75.6	86.9	P	69.6	P	78.3	P	17.3	95.7	47.7	48.0	26.0	
	Moulmein . . .	94	29.830	—002	29.863	30.049	29.620	.429	.192	75.5	87.6	—0.4	71.9	0	79.8	—0.2	15.7	98.4	58.4	40.0	24.4	
	Toungoo . . .	181	29.722	+003	29.848	29.987	29.499	.488	.208	73.8	88.8	—1.3	69.7	—0.6	79.3	—1.0	19.1	103.7	51.1	52.6	28.1	
LOWER BURMA .	Rangcon . . .	41	29.870	—008	29.849	30.099	29.570	.529	.215	75.0	88.3	—0.9	71.9	—0.9	80.1	—0.9	16.4	102.1	56.2	45.9	25.0	
	Bassein . . .	27	29.886	—001	29.850	30.121	29.630	.491	.214	75.2	87.5	—0.3	70.9	—0.9	79.2	—0.6	16.6	100.2	55.0	45.2	24.7	
	Diamond Island . .	41	29.869	—007	29.845	30.090	29.607	.483	.207	78.7	83.8	—1.8	75.1	0	79.5	—1.0	8.7	90.1	66.4	23.7	15.2	
ARAKAN .	Akyab . . .	20	29.875	—005	29.838	30.138	29.543	.595	.236	74.9	85.0	—1.1	70.6	—1.5	77.8	—1.3	14.4	93.6	49.2	44.4	23.0	
II.—Burma Inland.			...	...	+012	...	...	...	...	...	88.8	—1.7	68.4	—0.8	78.7	—1.3	20.4	...	...	61.2	31.4
CENTRAL BURMA .	Thayetmyo . . .	134	29.767	+012	29.844	30.081	29.520	.561	.218	75.4	89.9	—1.7	68.7	—0.8	79.3	—1.3	21.2	106.6	45.4	61.2	31.4	
	Minbu* . . .	P	29.743	P	P	30.028	29.448	.580	.224	77.6	92.5	P	71.4	P	82.0	P	21.1	109.1	45.0	64.1	31.7	
	Yamethin* . . .	P	29.724	P	P	29.465	28.994	.471	.220	77.0	91.3	P	71.4	P	81.4	P	19.9	108.1	48.0	60.1	30.3	
UPPER BURMA .	Mandalay . . .	P	29.640	P	P	29.953	29.367	.586	.228	77.5	89.9	P	69.0	P	79.5	P	20.9	105.9	45.1	60.8	32.0	
	Kendat . . .	P	29.511	P	P	29.866	29.181	.685	.269	70.5	84.3	P	66.2	P	75.3	P	18.1	103.8	44.0	59.8	29.7	
	Bhamo . . .	P	29.507	.P	P	29.842	29.214	.628	.251	69.9	85.1	P	63.9	P	74.5	P	21.3	100.6	39.4	61.2	33.2	
III.—Assam.			...	...	+015	...	...	...	...	...	81.9	—1.8	66.2	—0.5	74.4	—1.0	16.3	...	...	56.4	27.5
ASSAM (SURMA) .	Silchar . . .	104	29.794	+011	29.852	30.093	29.343	.750	.269	71.7	84.7	—0.9	67.0	—0.4	75.9	—0.7	17.7	101.6	42.9	58.7	29.6	
BRAHMAPUTRA .	Sibsagar . . .	333	29.596	+026	29.898	29.970	29.207	.763	.282	68.5	80.2	—2.0	65.3	—0.6	72.8	—1.3	14.9	98.6	40.9	57.7	27.8	
	Dhubri . . .	115	29.763	+007	29.835	30.102	29.362	.740	.290	70.0	80.7	—2.4	P	P	P	P	P	98.8	46.0	52.8	25.1	
IV.—Bengal and Orissa.			...	...	+006	...	...	...	...	...	83.9	—2.5	69.1	—0.7	76.8	—1.6	15.1	...	...	55.0	26.8
EAST BENGAL .	Chittagong . . .	87	29.803	+005	29.839	30.076	29.370	.706	.258	73.8	83.4	—0.9	68.6	—0.8	76.0	—0.9	14.8	92.7	46.1	46.6	24.3	
	Lungleh . . .	P	P	P	P	P	P	P	P	64.4*	70.6*	P	P	P	P	P	P	84.8	48.2	36.6	P	
	Noakhali . . .	43	29.829	P	29.819	30.135	29.352	.783	.272	74.2	82.5	P	68.2	P	75.4	P	14.2	94.7	42.0	52.7	25.5	
	Comilla . . .	36	29.842	P	29.826	30.118	29.370	.748	.276	73.5	84.2	P	67.8	P	76.0	P	16.3	95.3	43.1	52.2	26.9	
	Sirajganj . . .	46	29.818	P	29.814	30.121	29.326	.795	.286	72.2	83.2	P	67.4	P	75.3	P	15.9	100.7	40.0	60.7	27.9	
	Dacca . . .	20	29.844	+005	29.814	30.139	29.205	.930	.295	73.6	84.3	—2.3	69.5	—0.9	76.9	—1.6	14.8	96.1	46.2	49.9	25.1	
	Barisal . . .	13	29.851	+012	29.809	30.135	29.337	.798	.298	74.8	84.1	P	69.3	P	76.7	P	14.8	95.3	44.6	50.7	26.0	
	Mymensingh . . .	56	29.812	+006	29.825	30.108	29.354	.754	.275	72.0	82.4	P	67.7	P	75.1	P	14.7	96.2	41.7	54.5	25.9	
	DELTAIC BENGAL .	Faridpur . . .	46	29.834	P	29.829	30.130	29.306	.824	.294	73.5	82.3	P	68.8	P	75.7	P	13.5	97.5	43.0	54.5	25.1
		Jessore . . .	33	29.830	+006	29.810	30.151	29.225	.926	.310	74.4	84.7	—3.2	69.2	—0.7	77.0	—2.0	15.5	101.5	43.4	58.1	27.5
Calcutta . . .		21	29.837	+007	29.805	30.163	29.029	1.134	.334	74.3	83.9	—2.5	69.7	—0.8	76.8	—1.7	14.2	97.1	45.7	51.4	24.9	
Saugor Island . . .		25	29.831	+004	29.800	30.157	28.983	1.174	.338	75.8	83.6	—1.8	72.2	—1.3	78.0	—1.6	11.4	97.2	48.1	49.1	23.2	
	Krishnagar . . .	47	29.811	P	29.807	30.134	29.164	.970	.319	74.3	85.1	P	68.5	P	76.8	P	16.6	103.0	40.5	62.5	29.9	
	Midnapore . . .	149	29.715	P	29.812	30.038	29.269	.769	.323	74.9	86.8	P	69.5	P	78.2	P	17.3	107.4	45.1	62.3	29.7	

* Mean of 11 months (wanting for November).

ANNUAL SUMMARY, 1893.

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I.
at 193 Stations in India, Burma, etc., in the year 1893.

WIND DIRECTION.									WIND VELOCITY.			HYGROMETRY 8 A.M.		Mean cloud amount of year.	RAINFALL.					STATION.	METEOROLOGICAL PROVINCE OR DISTRICT.		
Number of winds from									Mean velocity in miles per hour.	Normal.	Percentage variation.	Mean humidity of year.	Mean vapour tension of year.		Number of rainy days during year.	Normal number of rainy days.	Variation.	Rainfall of year.	Normal rainfall of year.			Variation from normal of year.	Heaviest rainfall in 24 hours during year.
Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.															
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	136.03	136.88	-0.85	...	I.—Burma Coast and Bay Islands.	
54	40	43	26	26	27	62	62	25	6.3	7.4	-17	85	.870	6.2	132	?	?	96.22	116.98	-20.76	5.97	Port Blair	BAY ISLANDS.
36	43	57	48	7	113	36	14	1	46	?	?	82	.854	6.7	129	?	?	114.73	114.36	+0.37	5.27	Camorta,	
...	78	46	24	42	32	35	25	83	1.4	1.8	-22	82	.800	6.2	157	?	?	146.13	163.10	-16.97	5.15	Mergui	TENASSERIM.
315	1	7	...	2	6	18	4	12	1.5	?	?	86	.770	3.5	152	?	?	212.82	197.19	+15.63	7.02	Tavoy.	
4	24	55	85	73	65	29	24	4	3.3	2.7	+22	85	.763	3.8	139	137.55	+1.45	193.09	181.13	+11.96	7.74	Moulmein.	
108	71	2	7	92	56	1	1	13	2.3	3.1	-26	88	.761	5.3	117	113.72	+3.28	71.11	82.61	-11.50	2.55	Toungoo.	
1	21	44	43	28	52	86	64	26	4.3	4.6	-7	88	.780	4.8	122	119.16	+2.84	106.92	96.32	+10.60	5.05	Rangoon	LOWER BURMA.
44	5	53	22	48	50	30	27	86	4.4	3.7	+19	88	.787	4.8	125	130.36	-5.36	100.97	106.44	-7.47	3.70	Bassein.	
20	41	74	31	17	21	77	31	48	10.9	7.4	+47	80	.787	6.0	120	118.44	+1.56	112.85	125.06	-12.21	4.65	Diamond Island.	
...	119	113	41	28	51	5	3	5	3.3	3.2	+3	87	.783	5.1	127	119.91	+7.09	205.41	183.61	+21.80	11.39	Akyab	ARAKAN.
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	55.46	54.91	+6.88	...	II.—Burma Inland.	
...	76	27	5	99	.97	16	6	39	4.9	5.0	+2	76	.690	4.2	85	76.08	+8.92	51.87	39.01	+12.86	3.17	Thayetmyo	CENTRAL BURMA.
25	17	10	17	144	19	3	9	62	9.0	?	?	78	.754	1.8	66	?	?	41.51	?	?	6.15	Minbu.*	
47	35	7	4	102	80	3	...	19	8.0	?	?	80	.746	0.7	69	?	?	44.10	?	?	3.40	Yamethin.*	
72	53	16	9	36	139	26	4	10	4.4	?	?	71	.685	4.5	53	?	?	41.49	32.76	+8.73	3.16	Mandalay	UPPER BURMA.
86	35	6	12	23	20	22	83	78	1.8	?	?	90	.699	6.5	95	?	?	75.92	71.29	+4.63	5.96	Kendat.	
136	32	63	1	7	7	23	12	83	?	?	?	84	.652	5.4	108	?	?	77.86	76.56	+1.30	4.80	Bhamo.	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	107.48	101.50	+5.98	...	III.—Assam.	
309	1	11	22	9	6	2	3	...	2.6	2.7	-4	89	.713	6.7	132	135.79	-3.79	146.05	126.88	+19.17	11.43	Silchar	ASSAM (SURMA).
102	4	107	31	35	7	57	9	3	1.7	2.4	-29	95	.699	5.7	132	126.18	+5.82	84.29	90.25	-5.96	3.35	Sibsagar	BRAHMAPUTRA.
50	33	142	73	15	7	34	1	5	5.1	4.7	+9	89	.685	5.5	107	87.39	+19.61	92.11	87.37	+4.74	4.15	Dhubri.	*
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	89.99	70.56	+18.87	...	IV.—Bengal and Orissa.	
35	36	97	54	65	43	16	4	15	3.7	5.1	-27	89	.760	5.5	105	96.01	+8.99	125.63	100.63	+25.00	7.53	Chittagong	EAST BENGAL.
...	...	...	Not recorded.	...	...	...	...	...	?	?	?	87*	.536*	?	124	?	?	145.42	?	?	9.30	Lungleh.	
5	83	55	56	78	27	40	5	15	5.0	?	?	87	.773	3.1	118	108.60	+9.40	146.84	121.57	+25.27	20.67	Noakhali.	
77	42	15	106	37	56	25	2	5	3.9	?	?	88	.757	4.9	126	101.66	+24.34	112.91	91.63	+21.28	5.30	Comilla.	
114	20	24	44	44	43	38	24	14	2.7	?	?	90	.743	5.4	101	76.30	+24.70	89.14	61.16	+27.98	7.34	Sirajganj.	
37	44	46	49	44	76	28	9	23	5.3	4.5	+18	87	.748	5.7	101	89.49	+11.51	85.02	70.53	+14.49	4.61	Dacca.	
240	10	20	8	23	36	24	...	4	3.3	?	?	87	.781	6.0	121	102.35	+18.65	102.67	79.71	+22.96	5.57	Barisal.	
33	22	67	105	73	21	13	10	21	3.8	?	?	88	.728	5.3	127	104.65	+22.35	109.85	85.92	+23.93	3.87	Mymensingh.	
137	39	5	40	41	63	23	11	6	3.2	?	?	89	.767	4.6	101	88.80	+12.20	89.06	69.11	+19.95	6.45	Faridpur	DELTAIC BENGAL.
100	42	25	21	62	50	29	11	25	3.5	3.2	+9	88	.785	5.4	105	87.97	+17.03	71.14	65.24	+5.90	3.70	Jessore.	
99	44	23	32	27	40	70	18	12	3.5	4.7	-26	85	.752	4.9	96	87.19	+8.81	85.23	61.89	+23.34	8.46	Calcutta.	
1	55	68	34	17	65	74	22	20	12.7	10.8	+18	87	.811	6.4	95	86.54	+8.46	94.47	75.62	+18.85	6.08	Saugor Island.	
11	33	18	65	47	59	32	54	46	4.6	?	?	82	.723	5.2	92	74.05	+17.95	70.17	53.86	+16.31	3.93	Krishnagar.	
36	90	56	4	25	80	43	2	29	5.9	?	?	79	.721	3.4	87	76.45	+10.55	72.73	56.03	+16.70	6.52	Midnapore.	

* Mean of 10 months (wanting for January and February).

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Table

Abstract of Observations taken at 8 A.M.

METEOROLOGICAL PROVINCE OR DISTRICT.	STATION.	Elevation of bar-cistern above sea-level in feet.	PRESSURE, 8 A.M., IN INCHES.								TEMPERATURE OF AIR.											
			Mean actual pressure reduced to 32° of year.	Variation from normal.	Mean pressure of year reduced to sea-level and to constant gravity 45° Lat.	Highest pressure recorded during year.	Lowest pressure recorded during year.	Absolute range during year.	Mean monthly range of pressure.	Mean of 8 A.M. of year.	Mean maximum of year.	Variation from normal of year.	Mean minimum of year.	Variation from normal of year.	Mean daily temperature of year.	Variation from normal of year.	Mean daily range of temperature.	Highest temperature observed during year.	Lowest temperature observed during year.	Absolute range during year.	Mean monthly absolute range.	
CENTRAL BENGAL.	Bankura . . .	298	29.538	P	29.793	29.871	29.978	.893	.294	73.4	85.9	P	68.9	P	77.4	P	17.0	108.1	45.1	63.0	29.7	
	Raniganj . . .	334	29.528	P	29.816	29.850	29.113	.737	.306	72.8	87.6*	P	67.4*	P	P	P	P	107.0	44.7	62.3	P	
	Burdwan . . .	99	29.741†	+ .010	29.789†	30.090	29.135	.955	.337	73.7	85.3	-3.4	69.9	-0.5	77.7	-2.0	15.5	105.7	45.1	60.6	27.2	
	Naya Dumka . . .	489	29.354	P	29.811	29.678	29.020	.658	.291	72.8	84.4	P	67.3	P	75.9	P	17.1	106.2	41.0	65.2	29.9	
	Berhampore . . .	67	29.794	+ .007	29.810	30.123	29.257	.866	.305	72.1	84.2	-3.6	69.4	0	76.8	-1.8	14.8	105.2	43.1	62.1	26.6	
	Rampur Boalia . . .	70	29.786	P	29.806	30.114	29.264	.850	.297	74.2	83.5	P	67.3	P	75.4	P	16.3	102.5	40.7	61.8	28.7	
	Malda . . .	72	29.778	P	29.813	30.121	29.334	.787	.294	72.8	84.4	P	70.5*	P	78.6*	P	16.2*	103.7	47.5	56.2	28.0*	
NORTH BENGAL.	Bogra . . .	61	29.796	P	29.811	30.114	29.321	.793	.267	72.4	83.9	P	66.5	P	75.2	P	17.4	102.3	41.2	61.1	29.0	
	Dinajpur . . .	123	29.747	+ .015	29.824	30.074	29.332	.742	.285	71.9	83.6	P	67.1	P	75.4	P	16.5	103.1	40.5	62.6	29.3	
	Rangpur . . .	123	29.750	P	29.830	30.076	29.347	.729	.285	71.1	82.9	P	66.0	P	74.5	P	16.9	99.8	40.1	59.7	28.7	
ORISSA.	Jalpaiguri . . .	284	29.602	P	29.846	29.931	29.226	.705	.288	70.5	82.3	P	65.4	P	73.9	P	16.9	97.9†	42.1	55.8	27.8	
	Balasore . . .	56	29.796	+ .002	29.799	30.122	29.147	.975	.320	74.8	85.3	P	69.7	P	77.5	P	15.6	102.5	46.4	56.1	28.7	
	False Point . . .	21	29.838	0	29.801	30.149	28.913	1.236	.330	77.0	84.2	-1.8	71.6	-0.5	77.9	-1.2	12.6	97.0	49.5	47.5	24.8	
	Cuttack . . .	80	29.769	+ .001	29.793	30.091	29.155	.936	.313	76.7	88.1	-3.4	72.0	-0.4	80.1	-1.9	16.1	105.1	51.4	53.7	27.5	
	Shortt's Island . . .	P	29.833	P	P	30.151	29.397	.754	.361	78.9	83.7	P	75.2	P	79.5	P	8.5	5.2	59.7	35.5	18.4	
	Puri . . .	15	29.836	P	29.790	30.144	29.298	.846	.285	77.3	85.4	P	73.9	P	79.7	P	11.5	96.7	50.5	46.2	24.8	
V.—Gangetic Plain and Chota Nagpur.			...	...	+ .007	...	...	...	...	...	85.0	-3.2	66.1	-0.6	75.5	-1.9	18.9	...	...	66.8	32.1
CHOTA NAGPUR.	Hazaribagh . . .	2,007	27.828	- .001	29.806	28.121	27.391	.730	.265	70.0	81.5	-2.8	63.5	-1.7	72.5	-2.2	18.1	102.2	40.2	62.0	30.9	
	Ranchi . . .	2,128	27.704	P	29.801	27.987	27.238	.749	.269	69.5	80.8	P	63.4	P	72.1	P	17.4	102.0	40.5	61.5	30.1	
	Chaibassa . . .	760	29.075	+ .015†	29.800	29.393	28.609	.784	.295	72.6	86.6	P	67.8	P	77.2	P	18.9	106.8	43.6	63.2	31.4	
BIHAR, SOUTH.	Gaya . . .	375	29.468	+ .005	29.880	29.822	29.030	.792	.268	72.7	87.0	-2.9	67.7	-0.7	77.4	-1.8	19.3	109.1	43.0	66.1	32.8	
	Dehri . . .	351	29.491†	P	29.803	29.862	29.112	.750	.282	74.1	86.1	P	67.8	P	77.0	P	18.3	109.4	43.0	66.4	32.1	
	Patna . . .	183	29.669	+ .003	29.808	30.033	29.266	.767	.283	74.1	84.8	-3.0	67.8	-0.4	76.3	-1.7	17.0	108.5	40.7	67.8	31.8	
	Arrah . . .	190	29.653	P	29.799	30.019	29.253	.766	.283	72.5	86.1	P	67.2	P	76.7	P	18.9	107.9	40.5	67.4	32.4	
	Buxar . . .	239	29.601	P	29.806	29.986	29.126	.860	.291	73.2	85.4	P	67.1	P	76.4	P	18.3	109.0	42.4	66.6	32.4	
BIHAR, NORTH.	Purnea . . .	125	29.734	+ .013	29.816	30.086	28.957	1.129	.324	70.8	84.1	-2.9	66.7	+0.7	75.4	-1.1	17.4	105.3	39.3	66.0	30.1	
	Bhagalpur . . .	160	29.688	P	29.804	30.050	29.308	.742	.287	73.2	84.8	P	66.8	P	75.9	P	18.0	106.3	40.5	65.8	30.6	
	Darbhanga . . .	166	29.693	+ .009	29.816	30.050	29.315	.735	.291	72.1	83.8	-1.8	68.0	-0.6	75.9	-1.2	15.8	103.5	44.6	58.9	27.4	
	Muzaffarpur . . .	178	29.679	P	29.815	30.055	29.301	.754	.286	71.6	84.0	P	66.7	P	75.4	P	17.4	104.7	41.8	62.9	29.3	
	Motihari . . .	224	29.615	P	29.804	29.989	29.244	.745	.285	71.3	84.7	P	64.8	P	74.7	P	19.8	105.2	39.0	66.2	32.1	
N.W. PROVINCES (EASTERN DISTRICTS).	Chapra . . .	181	29.671	P	29.809	30.042	29.273	.769	.285	72.9	85.2	P	67.2	P	76.2	P	18.0	107.2	41.9	65.3	31.3	
	Benares . . .	267	29.576	+ .008	29.805	29.943	29.149	.794	.284	71.5	85.9	-4.1	65.9	-1.0	75.9	-2.6	20.0	105.8	39.4	70.4	33.9	
	Allahabad . . .	309	29.527	- .001	29.798	29.692	29.084	.808	.292	72.8	87.4	-2.6	66.3	-0.2	76.9	-1.4	21.1	111.4	40.4	71.0	35.3	
N.W. PROVINCES (EAST SUBMONTANE).	Gorakhpur . . .	256	29.590	+ .015	29.811	29.530	29.203	.727	.280	72.2	84.1	-4.4	66.2	-1.0	75.2	-2.7	17.9	108.3	39.3	69.0	31.2	
ODISH, SOUTH.	Lucknow . . .	370	29.460	+ .003	29.805	29.949	29.071	.778	.287	70.5	85.8	-4.0	64.5	-0.8	75.1	-2.4	21.3	111.3	40.0	71.3	35.0	
ODISH, NORTH.	Bahraich . . .	403	*29.411†	P	*29.784†	*29.753†	*29.040†	*713†	*286†	71.2	84.9	P	62.8*	P	73.0*	P	20.6*	109.6	38.1	71.5	32.9	
N.W. PROVINCES (CENTRAL).	Cawnpore . . .	416	29.425	P	29.811	29.793	29.031	.762	.288	72.3	86.0	P	64.7	P	75.3	P	21.4	109.1	39.0	70.1	35.1	
	Mainpuri . . .	516	29.303	P	29.791	29.674	28.922	.752	.276	70.5	86.6	P	64.2	P	75.4	P	22.4	111.7	38.0	73.7	36.9	
VI.—Upper Sub-Himalayas.			...	...	+ .007	...	...	...	...	3.1	-4.1	61.8	-0.7	72.4	-2.4	21.1	...	...	73.4	36.1	
N.W. PROVINCES (SUBMONTANE).	Bareilly . . .	568	29.254	+ .008	29.802	29.618	28.862	.756	.283	69.0	83.4	-4.3	63.4	-1.0	73.5	-2.7	20.0	109.4	36.7	72.7	34.7	
	Dehra Dun . . .	2,233	27.605	- .001	29.833	27.912	27.240	.672	.282	64.3	77.7	-2.8	59.6	-1.4	68.7	-2.1	18.2	100.0	34.5	65.5	30.7	
	Roorkee . . .	887	28.930	- .003	29.810	29.279	28.519	.760	.304	67.0	83.4	-3.9	61.9	-0.6	72.7	-2.3	21.5	108.7	35.8	72.9	36.1	
	Meerut . . .	738	29.088	+ .013	29.812	29.445	28.689	.756	.293	68.5	84.3	-3.6	62.4	-1.1	73.4	-2.4	21.9	110.3	36.0	74.3	35.5	

* Mean of 11 months (wanting for June.)

† " " " (wanting for October and November.)

I—contd.

at 193 Stations in India, Burma, etc., in the year 1893—contd.

WIND DIRECTION.									WIND VELOCITY.			HYGROMETRY & A.M.		RAINFALL.							STATION.	METEOROLOGICAL PROVINCE OR DISTRICT.	
Number of winds from									Mean velocity in miles per hour.	Normal.	Percentage variation.	Mean humidity of year.	Mean vapour tension of year.	Mean cloud amount of year.	Number of rainy days during year.	Normal number of rainy days.	Variation.	Rainfall of year.	Normal rainfall of year.	Variation from normal of year.			Heaviest rainfall in 24 hours during year.
Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.															
145	29	9	32	28	35	15	44	27	2.9	P	P	80	.690	4.7	98	82.80	+15.20	79.27	56.57	+22.70	5.83	Bankura	CENTRAL BENGAL.
55	39	40	24	45	23	44	16	79	2.4	P	P	81	.692	1.9	88	72.85	+15.15	61.78	53.25	+8.53	3.62	Raniganj.	
100	50	28	31	30	42	42	11	28	4.2	3.2	+31	79	.697	5.4	89	78.00	+11.00	81.85	55.85	+26.00	9.62	Burdwan.	
50	29	15	63	47	39	25	34	63	3.2*	P	P	78	.666	3.0	100	79.41	+20.59	74.71	57.23	+17.48	2.73	Naya Dumka.	
38	40	14	78	27	59	44	29	36	3.2	3.4	-6	91	.750	5.5	103	77.93	+25.07	77.38	56.50	+20.88	4.04	Berhampore.	NORTH BENGAL.
53	63	46	21	68	30	64	7	12	4.6	P	P	84	.744	4.3	101	74.56	+26.44	74.34	58.19	+16.15	4.00	Rampur Boalia.	
37	...	47	1	115	10	64	2	87	3.2	P	P	84	.717	3.7	98	68.25	+29.75	71.37	55.48	+15.89	2.60	Malda.	
74	14	75	63	87	11	5	17	9	2.8	P	P	86	.722	3.8	104	81.63	+22.37	85.29	67.89	+17.40	4.50	Bogra.	
0	18	106	93	38	24	16	49	21	2.9	P	P	85	.696	4.8	100	77.10	+22.90	79.56	69.48	+10.08	4.61	Dinajpur	ORISSA.
30	16	53	136	39	34	12	37	8	2.4	P	P	88	.705	2.3	96	78.70	+17.30	89.16	82.81	+6.35	6.22	Rangpur.	
72	56	71	74	47	13	5	8	17	2.9	P	P	85	.664	5.6	111	103.89	+7.11	122.32	127.58	-5.26	7.65	Jaipalguri.	
24	71	49	22	6	38	91	25	39	5.1	P	P	87	.782	2.9	95	84.60	+10.40	100.83	65.11	+35.72	6.08	Balasore	
3	93	15	8	18	48	80	61	39	10.2	9.2	+11	84	.800	5.8	78	75.00	+3.00	100.41	64.35	+36.06	14.99	False Point.	V.—Gangetic Plain and Chota Nagpur.
156	10	26	16	4	19	77	37	20	2.9	2.8	+4	75	.715	4.5	75	75.35	-0.35	76.71	58.19	+18.52	5.62	Cuttack.	
...	32	62	23	10	39	100	52	32	13.0	P	P	79	.804	4.3	55	P	P	50.44	P	P	5.08	Shortt's Island.	
80	95	32	7	4	7	85	38	13	9.7	P	P	82	.794	4.2	66	67.55	-1.55	74.04	54.18	+19.86	6.76	Puri.	
...	58.36	44.83	+13.53	...	V.—Gangetic Plain and Chota Nagpur.	CHOTA NAGPUR.
39	27	15	31	22	66	57	50	58	7.9	6.8	+16	73	.552	5.2	105	69.64	+35.36	87.28	51.26	+36.02	4.69	Hazaribagh	
106	20	10	16	24	19	74	41	54	6.7	P	P	76	.567	3.9	103	82.69	+20.31	77.28	56.16	+21.12	6.02	Ranchi.	
135	15	20	18	16	30	68	56	7	1.3	P	P	81	.676	5.1	95	77.21	+17.79	64.71	55.88	+8.83	4.17	Chaibassa.	
4	11	9	107	46	97	24	56	11	5.8	2.6	+123	79	.672	3.9	69	56.18	+12.82	46.15	46.94	-0.79	2.35	Gaya	BIHAR, SOUTH.
3	8	15	73	29	47	133	44	13	4.2	P	P	75	.659	2.5	77	54.74	+22.26	47.17	43.11	+4.06	3.80	Dehri.	
23	2	32	119	25	23	44	83	14	4.7	3.0	+57	75	.658	4.6	62	55.72	+6.28	52.88	45.18	+7.70	3.87	Patna.	
3	35	52	59	38	30	35	74	39	2.7	P	P	79	.672	2.7	67	55.69	+11.31	54.45	41.94	+12.51	3.04	Arrah.	
13	12	29	114	17	10	42	101	27	4.9	P	P	75	.647	4.1	80	53.95	+26.05	50.51	39.82	+10.69	3.62	Buxar.	BIHAR, NORTH.
140	15	44	59	29	5	26	16	10	2.4	2.3	+4	88	.702	2.8	86	70.37	+15.63	70.96	65.76	+5.20	5.16	Purnea	
227	7	17	44	26	13	19	12	...	1.4	P	P	80	.693	4.6	82	60.55	+21.45	66.58	44.84	+21.74	3.35	Bhagalpur.	
47	9	44	96	60	9	30	45	25	4.1	4.0	+3	82	.683	3.6	79	60.17	+18.83	64.70	50.69	+14.01	5.44	Darbhanga.	
65	2	29	91	66	1	30	55	26	4.1	P	P	87	.703	3.5	78	56.41	+21.59	59.17	48.26	+10.91	9.84	Muzaffarpur.	N.-W. PROVINCES (EASTERN DISTRICTS).
75	3	60	86	38	5	31	51	16	4.9	P	P	82	.663	3.8	83	53.13	+29.87	87.42	47.37	+40.05	6.36	Motihari.	
46	11	26	84	49	11	61	55	22	4.6	P	P	80	.679	4.5	67	51.35	+15.65	45.59	42.28	+3.31	2.93	Chapra.	
133	9	30	60	14	10	55	48	6	3.8	3.9	-3	82	.672	4.1	75	50.54	+24.46	46.05	38.06	+7.99	3.85	Benares	
60	12	43	52	27	16	36	69	50	5.1	2.9	+76	73	.616	4.3	57	48.47	+8.53	49.60	35.75	+13.85	4.27	Allahabad.	N.-W. PROVINCES (EAST SUBMONTANE).
50	39	32	66	21	31	14	94	18	2.0	2.5	-20	76	.640	2.9	75	52.29	+22.71	57.15	47.47	+9.68	4.74	Gorakhpur	
263	6	...	53	1	1	...	49	2	1.0	3.0	-67	77	.601	4.3	63	46.83	+16.19	52.35	35.51	+16.84	5.55	Lucknow	
49	25	41	43	63	10	30	30	74	3.8	P	P	83	.674	2.9	71	P	P	57.28	40.94	+16.34	4.80	Baraich	
50	17	40	49	45	20	34	60	42	3.9	P	P	77	.641	3.4	56	41.40	+14.60	57.21	31.08	+26.13	6.00	Cawnpore	N.-W. PROVINCES (CENTRAL).
188	20	31	16	19	5	5	12	69	1.1	P	P	75	.587	4.3	51	P	P	31.05	33.08	-2.03	4.12	Mainpuri.	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	48.06	38.80	+9.26	...	VI.—Upper Sub-Himalayas.
206	12	11	3	66	4	6	13	44	1.7	3.5	-51	78	.596	3.9	69	47.17	+21.83	56.22	48.34	+7.88	4.63	Bareilly	
352	2	2	2	...	2	1	2	2	1.0	1.8	-44	78	.505	4.8	109	79.59	+29.41	108.23	84.11	+24.12	5.84	Dehra Dun.	N.-W. PROVINCES (SUBMONTANE).
224	10	5	20	53	15	2	11	25	1.9	2.5	-24	79	.554	4.0	64	46.57	+17.43	41.07	43.70	-2.63	3.10	Roorkee.	
149	2	7	57	24	1	12	97	16	1.8	2.2	-18	71	.534	3.5	55	39.18	+15.82	30.37	33.00	-2.63	1.95	Meerut.	

* Mean of 11 months (wanting for October).

Table

Abstract of Observations taken at 8 A.M.

METEOROLOGICAL PROVINCE OR DISTRICT.	STATION.	Elevation of barometer above sea-level in feet.	PRESSURE, 8 A.M., IN INCHES.							TEMPERATURE OF AIR.												
			Mean actual pressure (reduced to 32° of year.	Variation from normal.	Mean pressure of year reduced to sea-level and to constant gravity 45° Lat.	Highest pressure recorded during year.	Lowest pressure recorded during year.	Absolute range during year.	Mean monthly range of pressure.	Mean of 8 A.M. of year.	Mean maximum of year.	Variation from normal of year.	Mean minimum of year.	Variation from normal of year.	Mean daily temperature of year.	Variation from normal of year.	Mean daily range of temperature.	Highest temperature observed during year.	Lowest temperature observed during year.	Absolute range during year.	Mean monthly absolute range.	
PUNJAB, CENTRAL.	Delhi	718	29.104	+0.04	29.802	29.448	28.720	.728	.291	70.6	84.3	-5.3	66.1	-1.1	75.2	-3.2	18.2	110.1	39.6	70.5	32.3	
	Lahore	702	29.108	+0.08	29.802	29.508	28.690	.818	.337	69.2	85.6	-3.2	62.1	+0.9	73.9	-1.2	23.5	112.3	33.2	79.1	40.0	
PUNJAB, SUBMONTANE.	Umballa	962	28.171*	P	29.870*	29.289	28.539	.750	.319	75.2	84.9	P	P	P	P	P	P	110.9	37.0	73.9	P	
	Ludhiana	812	29.009	+0.12	29.811	29.377	28.602	.775	.321	68.8	84.1	-4.8	62.8	-0.4	73.5	-2.6	21.3	110.4	36.3	74.1	37.1	
PUNJAB, NORTH.	Sialkot	830	28.987	+0.19	29.811	29.375	28.565	.810	.335	68.2	83.8	-3.9	61.7	-0.4	72.8	-2.2	22.1	112.3	34.8	77.5	39.9	
	Rawalpindi	1,649	28.168	+0.04	29.805	28.524	27.775	.745	.326	62.2	79.4	-5.0	56.2	-0.9	67.8	-2.9	23.2	104.0	30.9	73.1	38.6	
VII.—Indus Valley and North-West Rajputana.			...	...	0	...	...	...	...	...	89.8	-1.5	64.1	+0.1	76.6	-0.7	25.2	...	...	78.9	41.0
PUNJAB, WEST.	Peshawar	1,110	28.736	+0.07	29.811	29.122	28.254	.868	.347	66.0	83.6	-2.1	58.5	-0.2	71.1	-1.2	25.1	112.0	31.9	80.1	42.9	
	Mardan	P	P	P	P	P	P	P	P	65.8	97.4	P	P	P	P	P	P	113.9	31.0	82.9	P	
	Khushab	612	29.198	P	29.797	29.610	28.733	.877	.344	69.5	86.9	P	62.7	P	74.8	P	24.2	114.1	33.1	81.0	41.9	
	Montgomery	558	29.253	P	29.792	29.661	28.802	.859	.346	72.2	90.2	P	62.9	P	76.6	P	27.3	114.9	32.3	82.6	44.2	
	D. I. Khan	573	29.232	-0.09	29.793	29.646	28.743	.903	.360	68.3	88.1	-2.4	61.4	-0.7	74.7	-1.6	26.6	111.1	32.0	79.1	43.3	
	Mooltan	420	29.397	+0.02	29.797	29.826	28.934	.892	.349	72.0	90.4	-0.7	65.6	+1.3	78.0	+0.3	24.8	114.5	35.1	79.4	40.7	
	Sirsa	662	29.150	+0.01	29.794	29.527	28.746	.781	.324	69.8	89.6	-1.7	63.4	+0.1	76.6	-0.8	26.3	115.4	31.7	83.7	41.9	
SIND AND CUTCH.	Jacobabad	186	29.637	+0.08	29.789	30.061	29.155	.906	.357	73.5	94.4	-0.6	65.0	+0.5	79.7	0	29.4	119.0	34.5	84.5	45.0	
	Hyderabad	117	29.717	-0.01	29.789	30.109	29.244	.865	.326	73.1	91.7	-1.3	68.1	-0.2	79.9	-0.8	23.6	115.2	43.4	71.8	37.9	
	Kurrachee	49	29.812	-0.07	29.813	30.171	29.396	.776	.317	73.9	85.8	=1.0	69.2	-0.4	77.5	-0.7	16.6	107.7	45.1	62.6	29.1	
RAJPUTANA, WEST.	Bickaneer	753	29.066	P	29.793	29.455	28.671	.784	.338	73.2	87.9	-2.1	P	P	P	P	P	112.9	P	P	P	
	Pachpadra	380	29.469	P	29.814	29.868	29.039	.829	.334	72.6	91.3	P	63.7	P	77.5	P	27.6	115.0	35.0	80.9	43.0	
VIII.—East Rajputana, Central India and Gujarat.			...	...	+0.06	...	...	...	...	...	87.9	-2.5	66.3	-0.5	77.1	-1.5	21.6	...	...	68.6	35.0
RAJPUTANA, EAST.	Jeyapore	1,431	28.421	+0.04	29.834	28.752	28.045	.707	.293	71.5	87.6	-2.4	63.9	-0.7	75.8	=1.6	23.7	111.8	36.7	75.1	38.7	
	Sambhar	1,254	28.524	-0.04	29.816	28.912	28.196	.716	.307	69.7	86.3	-2.5	63.3	-1.1	74.8	-1.8	23.0	107.0	36.5	70.5	36.9	
	Ajmere	1,611	28.253	+0.12	29.856	28.580	28.017	.563	.293	69.7	85.5	-3.0	64.1	+0.9	74.8	-1.1	21.4	107.9	35.9	72.0	36.0	
	Deesa	466	29.394	-0.05	29.825	29.705	29.006	.699	.281	73.5	91.0	-2.1	66.3	-0.4	78.7	-1.3	24.7	111.5	40.1	71.4	37.9	
KATHIAWAR.	Rajkot	429	29.450	+0.04	29.839	29.716	29.083	.633	.250	74.9	91.1	-2.0	65.9	0	78.5	-1.0	25.2	110.4	33.6	76.8	38.1	
	Veraval	P	29.874	P	29.834	30.114	29.531	.583	.235	75.9	84.4	P	70.7	P	77.5	P	13.7	101.1	40.3	60.8	28.5	
	Bhavnagar	P	29.866	P	29.852	30.140	29.510	.630	.242	75.9	89.9	P	70.8	P	80.4	P	19.1	105.4	45.0	60.4	32.1	
CENTRAL INDIA.	Nowgong	757	29.085	+0.03	29.814	29.430	28.659	.771	.283	71.9	86.6	-3.6	64.0	-1.3	75.3	-2.5	22.6	110.1	36.6	73.5	36.9	
	Indore	1,823	28.047	+0.11	29.843	28.329	27.701	.628	.241	70.5	85.5	-2.0	62.3	-1.4	73.9	-1.7	23.2	104.6	37.5	67.1	35.6	
	Neemuch	1,630	28.238	+0.14	29.849	28.546	27.877	.669	.275	70.9	85.8	-2.7	63.6	-0.6	74.7	-1.7	22.2	106.0	38.9	67.1	35.2	
GUJARAT.	Surat	36	29.856	-0.02†	29.935	30.098	29.500	.598	.222	75.2	90.1	-1.1	69.2	+0.2	79.6	-0.5	20.9	107.1	47.7	59.4	33.4	
	Ahmedabad†	176	29.707	P	29.834	30.009	29.350	.659	.252	77.2	91.3	P	70.2	P	80.8	P	21.0	111.3	48.7	62.8	32.0	
N.-W. P., WEST.	Agra	555	29.300	+0.02	29.828	29.646	28.927	.719	.283	71.7	87.4	-3.5	66.6	-0.7	77.0	-2.1	20.8	114.5	39.1	75.4	36.1	
	Jhansi	858	28.994	+0.12	29.823	29.350	28.599	.751	.286	74.0	88.4	-2.3	67.9	-0.1	78.2	-1.2	20.5	112.0	43.9	68.1	34.4	
IX.—Deccan.			...	...	+0.04	...	...	...	...	...	87.6	-2.5	66.5	-0.6	77.1	-1.6	21.2	...	...	61.2	33.2
BOMBAY, DECCAN.	Belgaum	2,524	27.383	0	29.846	27.548	27.156	.332	.164	70.1	82.4	-2.0	63.3	-0.6	72.9	-1.3	19.1	98.8	51.9	46.9	28.3	
	Sholapur	1,590	28.306	+0.08	29.851	28.534	27.992	.542	.202	73.7	90.5	-2.1	67.0	-0.6	78.8	-1.4	23.5	106.7	50.6	56.1	33.9	
	Poona	1,840	28.061	+0.05	29.864	28.282	27.771	.511	.195	71.2	88.3	-0.2	63.8	-1.3	76.1	-0.8	24.5	104.5	46.5	58.0	35.5	
	Bijapur	1,946	27.953	P	29.850	28.157	27.673	.484	.187	73.0	88.2	P	65.7	P	77.0	P	22.5	103.8	46.6	57.2	33.3	
KHANDESH.	Malegaon	1,430	28.465	+0.14	29.863	28.716	28.134	.582	.217	73.0	89.5	-1.4	64.7	0	77.1	-0.7	24.8	107.8	40.3	67.5	37.9	
	Ahmednagar	2,152	27.749	P	29.856	27.974	27.449	.525	.203	71.7	86.7	P	62.1	P	74.4	P	24.6	104.7	39.4	65.3	37.7	
BERAR.	Akola	930	28.924†	+0.08†	29.809†	29.223	28.578	.645	.236†	73.1	89.6	-2.5	66.4	-0.3	78.0	-1.4	23.2	108.6	40.2	68.4	37.1	
	Amraoti	1,215	28.644	+0.06	29.826	28.922	28.284	.638	.229	73.7	88.4	-3.3	68.1	+0.1	78.3	-1.6	20.4	108.3	46.9	61.4	32.9	

* Mean of 10 months (wanting for July and August).

† Mean of 11 months {Surat wanting for May.

{Ahmedabad } wanting for January.

{Akola }

1—contd.

at 193 Stations in India, Burma, etc., in the year 1893—contd.

WIND DIRECTION.									WIND VELOCITY.			HYGROMETRY 8 A.M.		Mean cloud amount of year.	RAINFALL.							STATION.	METEOROLOGICAL PROVINCE OR DISTRICT.
Number of winds from									Mean velocity in miles per hour.	Normal.	Percentage variation.	Mean humidity of year.	Mean vapour tension of year.		Number of rainy days during year.	Normal number of rainy days.	Variation.	Rainfall of year.	Normal rainfall of year.	Variation from normal of year.	Heaviest rainfall in 24 hours during year.		
Calm.	N.	N. E.	E.	S. E.	S.	S. W.	W.	N. W.															
160	4	...	21	49	5	41	80	5	2.5	3.7	-32	67	.529	4.0	60	33.74	+26.26	33.26	29.98	+3.28	3.32	Dehli . . .	PUNJAB, CENTRAL.
167	18	11	31	59	18	5	40	16	2.1	2.4	-13	71	.533	2.9	40	28.26	+11.74	26.00	21.12	+4.88	3.32	Lahore.	
113	2	17	12	98	4	12	4	103	-2.0	?	?	80	.582	3.2	56	?	?	38.34	33.11	+5.23	3.43	Umballa . . .	PUNJAB, SUBMONTANE.
199	23	10	21	33	27	...	38	14	2.1	1.5	+40	73	.551	4.0	41	37.00	+4.00	37.96	31.11	+6.85	6.42	Ludhiana . . .	
207	34	8	88	9	3	...	10	6	1.7	1.8	-6	72	.528	2.8	58	38.36	+19.64	52.48	30.57	+21.91	2.89	Sialkot . . .	PUNJAB, NORTH.
201	8	55	20	29	5	6	14	27	1.1	2.0	-45	79	.495	3.2	65	46.81	+18.19	56.65	32.95	+23.70	9.80	Rawalpindi.	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15.86	9.36	+5.48	...	VII.—Indus Valley and North-West Rajputana.	
123	38	23	13	8	42	39	30	49	3.5	3.5	0	68	.471	3.0	34	21.56	+12.44	17.02	12.49	+4.53	1.88	Peshawar . . .	PUNJAB, WEST.
...	...	...	Not recorded.	...	...	...	...	...	?	?	?	?	?	?	37	?	?	27.16	?	?	6.32	Mardan.	
153	20	103	45	14	4	10	3	13	2.9	?	?	61	.486	2.5	25	16.40	+8.60	14.03	10.39	+3.64	1.42	Khushab.	
106	18	35	28	50	60	43	18	7	4.9	?	?	63	.528	2.2	30	15.70	+14.30	12.40	9.89	+2.51	2.70	Montgomery.	
200	17	52	43	6	7	11	7	22	1.8	1.7	+6	68	.541	2.0	22	14.73	+7.27	8.47	7.82	+0.65	1.29	D. I. Khan.	
97	6	50	3	115	4	78	2	10	2.0	2.4	-16	64	.539	1.9	18	11.72	+6.28	12.19	6.33	+5.86	3.62	Mooltan.	
131	21	8	24	55	13	33	68	12	5.1	3.6	+42	67	.527	3.1	34	23.39	+10.61	17.70	14.81	+2.89	2.52	Sirsa.	
136	7	27	48	91	28	5	5	18	3.6	3.4	+6	58	.524	1.7	11	6.63	+4.37	3.94	3.66	+0.28	0.74	Jacobabad . . .	SIND AND CUTCH.
32	54	36	8	...	54	147	6	28	16.9	10.0	+60	62	.534	1.6	12	10.14	+1.86	4.13	7.85	-3.72	0.56	Hyderabad.	
...	9	131	3	...	...	94	103	25	13.5	13.3	+2	77	.692	4.1	17	9.73	+7.27	12.21	7.77	+4.44	3.27	Kurrachee.	
13	32	32	20	22	54	124	25	43	5.7	4.6	+24	55	.478	2.7	27	?	?	12.81	11.62	+1.19	1.75	Bickaneer . . .	RAJPUTANA, WEST.
167	8	25	6	33	51	55	2	16	6.2*	6.3	-2	63	.550	5.1	37	?	?	48.30	10.28	+38.02	6.47	Pachpadra.	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	34.46	32.27	+4.87	...	VIII.—East Rajputana, Central India and Gujarat.	
85	29	41	24	14	11	63	59	39	3.8	5.1	-25	64	.515	4.0	50	38.70	+11.30	30.70	27.53	+3.17	2.01	Jeypore . . .	RAJPUTANA, EAST.
60	51	24	26	17	15	11	124	37	6.7	6.7	0	67	.508	3.0	43	32.56	+10.44	28.91	22.47	+6.44	2.73	Sambar.	
105	9	30	7	14	17	29	140	14	5.8	4.4	+32	69	.513	3.1	47	32.99	+14.01	32.83	22.65	+10.18	2.55	Ajmere.	
...	40	63	35	18	33	98	53	35	9.5	10.1	-6	62	.551	4.2	43	28.81	+14.19	49.53	25.77	+23.76	13.76	Deesa.	
26	33	50	44	8	3	35	117	49	9.0	8.8	+2	67	.616	3.3	35	33.94	+1.06	24.41	30.26	-5.85	8.62	Rajkot . . .	KATHIAWAR.
58	86	60	1	6	5	18	95	36	6.9	?	?	71	.670	4.8	18	?	?	14.11	?	?	4.77	Veraval.	
...	21	16	2	3	16	204	40	63	13.2	?	?	76	.709	3.6	30	?	?	16.28	?	?	2.02	Bhavnagar.	
66	34	21	36	6	26	48	103	25	3.0	2.4	+25	69	.558	4.1	63	49.75	+13.25	48.80	45.29	+3.51	3.98	Nowgong . . .	CENTRAL INDIA.
76	59	17	24	11	20	38	79	41	3.6	4.2	-14	72	.563	3.4	49	48.00	+1.00	39.80	36.24	+3.56	3.44	Indore.	
35	14	82	51	12	3	58	89	21	8.9	10.0	-11	61	.489	3.2	51	39.18	+11.82	43.49	32.06	+11.43	3.83	Neemuch.	
...	42	40	24	13	15	98	75	58	?	9.0†	?	75	.698	3.4	51	49.36	+1.64	45.45	43.34	+2.11	5.50	Surat . . .	GUJARAT.
20	28	52	37	14	9	61	25	41	5.4	?	?	65	.636	4.6	54	?	?	43.53	?	?	6.15	Ahmedabad.	
28	1	35	1	80	...	71	...	149	4.6	4.0	+15	67	.543	3.5	52	38.91	+13.09	26.18	30.18	-4.00	3.90	Agra . . .	N.-W. P., WEST.
96	28	30	13	14	18	85	20	61	2.4	3.4	-29	61	.532	2.8	57	49.07	+7.93	38.44	39.16	-0.72	3.06	Jhansi.	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	49.31	40.42	+7.57	...	IX—Deccan.	
67	20	28	53	27	3	32	96	31	?	?	?	73	.535	4.7	82	83.08	-1.08	51.60	47.50	+4.10	2.86	Belgaum . . .	BOMBAY, DECCAN.
34	17	34	44	48	6	49	62	71	11.1	8.9	+25	63	.542	4.4	46	51.01	-5.01	33.17	35.02	-1.85	4.86	Sholapur.	
114	2	5	37	16	1	18	114	50	9.2	10.0	-8	65	.522	4.0	46	49.36	-3.36	30.84	28.05	+2.79	3.78	Poona.	
19	3	33	24	59	6	57	78	86	6.7	?	?	68	.561	5.0	46	43.52	+2.48	27.71	27.17	+0.54	2.00	Bijapur.	
50	18	22	9	5	2	56	131	72	10.9	7.2	+51	72	.604	3.8	44	40.57	+3.43	21.43	27.50	-6.07	3.44	Malegaon . . .	KHANDESH.
76	60	33	13	34	14	28	56	51	11.8	?	?	74	.590	3.8	41	?	?	24.83	26.33	-1.50	2.12	Ahmednagar.	
44	14	22	49	23	19	24	138	32	6.3	5.4	+17	68	.558	4.2	61	50.58	+10.42	36.44	37.95	-1.51	2.38	Akola . . .	BERAR.
27	30	47	73	18	4	40	93	33	5.5	4.6	+20	65	.544	3.7	75	50.99	+24.01	38.29	33.98	+1.31	2.58	Amraoti.	

* Mean of 10 months (wanting for March and November).

Table

Abstract of Observations taken at 8 A.M.

METEOROLOGICAL PROVINCE OR DISTRICT.	STATION.	Elevation of bar-cistern above sea-level in feet.	PRESSURE, 8 A.M., IN INCHES.							TEMPERATURE OF AIR.											
			Mean actual pressure (reduced to 32°) of year.	Variation from normal.	Mean pressure of year reduced to sea-level and to constant gravity 45° Lat.	Highest pressure recorded during year.	Lowest pressure recorded during year.	Absolute range during year.	Mean monthly range of pressure.	Mean of 8 A.M. of year.	Mean maximum of year.	Variation from normal of year.	Mean minimum of year.	Variation from normal of year.	Mean daily temperature of year.	Variation from normal of year.	Mean daily range of temperature.	Highest temperature observed during year.	Lowest temperature observed during year.	Absolute range during year.	Mean monthly absolute range.
CENTRAL PROVINCES, WEST.	Khandwa . . .	1,044	28.817	+005	29.836	29.118	28.465	.653	.238	71.4	89.2	-2.0	65.8	-0.5	77.6	-1.3	23.4	107.2	39.2	68.0	36.6
	Hoshangabad . . .	1,023	28.837	-011*	29.833	29.156	28.462	.694	.251	71.6	86.8	-3.6	66.2	-0.4	76.5	-2.0	20.6	103.0	43.8	64.2	33.7
	Nagpur . . .	1,025	28.828	+006	29.818	29.135	28.453	.682	.246	75.3	88.6	-3.2	67.9	-0.5	78.3	-1.8	20.7	110.3	46.7	63.6	33.7
CENTRAL PROVINCES, CENTRAL.	Chanda . . .	634	29.229	P	29.819	29.535	28.818	.717	.244	74.0	89.0	P	67.7	P	78.4	P	21.3	110.4	45.3	65.1	34.4
	Seoni . . .	2,033	27.828*	P	29.844*	28.111	27.425	.686	.260*	71.7	83.9	-3.8	63.8	-0.9	73.9	-2.4	20.1	106.2	39.1	67.1	33.2
	Jubbulpore . . .	1,327	28.519	+005	29.825	28.831	28.100	.731	.268	70.7	85.3	-2.9	63.9	-0.4	74.6	-1.6	21.4	108.0	36.9	71.1	35.2
CENTRAL PROVINCES, EAST.	Saugor . . .	1,762	28.085	-002	29.822	28.384	27.687	.697	.263	70.6	85.6	-2.1	64.1	-1.4	74.9	-1.8	21.5	107.4	39.1	68.3	35.1
	Raipur . . .	970	28.885	+014	29.817	29.193	28.517	.676	.260	74.0	87.8	-2.2	66.7	-2.2	77.3	-2.2	21.1	110.0	41.4	68.6	33.6
	Sutna . . .	1,040	28.787	-005	29.804	29.127	28.298	.829	.285	72.0	85.1	-2.7	65.0	-0.1	75.1	-1.4	20.1	108.2	37.1	71.1	34.0
HYDERABAD, NORTH.	Sambalpur . . .	463	29.375	+004	29.793	29.694	29.005	.689	.268	75.5	87.7	-3.2	69.2	-0.7	78.5	-2.0	18.5	109.5	46.2	63.3	31.2
	Aurangabad . . .	P	28.038	P	P	28.280	27.725	.555	.209	75.2	89.0	P	64.7	P	76.9	P	24.2	106.9	46.6	60.3	35.5
	Indur . . .	P	P	P	P	P	P	P	P	75.4	87.9	P	68.2	P	78.1	P	19.6	107.3	45.1	62.2	32.9
HYDERABAD, SOUTH.	Bidar . . .	P	27.725	P	P	27.962	27.353	.609	.208	73.3	85.1	P	67.5	P	76.3	P	17.6	161.7	54.4	47.3	27.3
	Gulbarga . . .	1,502	28.390	P	P	28.608	28.051	.557	.202	74.2	89.4	P	67.5	P	78.5	P	21.8	106.9	50.6	56.3	32.7
	Raichur . . .	1,378	28.509*	P	P	28.727	28.180	.547	.202*	75.8	89.5	P	70.7	P	80.1	P	18.8	105.5	57.2	48.3	27.9
	Hyderabad (Deccan). . .	1,690	28.196	P	29.844	28.435	27.818	.617	.210	73.2	87.1	P	68.3	P	77.7	P	18.8	104.4	50.3	54.1	29.7
	Secunderabad . . .	1,787	28.110	+005	29.857	28.352	27.745	.607	.210	72.5	87.8	-2.3	67.8	-0.1	77.8	-1.2	20.0	106.2	50.6	55.6	31.0
	Khamamett . . .	373	29.499	P	P	29.799	29.149	.650	.230	77.2	90.0	P	72.2	P	81.1	P	17.8	109.7	53.7	56.0	28.9
X.—West Coast.			...	-004	...	...	...	...	...	85.5	-0.4	73.6	-0.1	79.6	-0.3	12.0	...	...	29.9	19.1	
KONKAN	Bombay . . .	37	29.873	+002	29.850	30.088	29.550	.538	.196	77.3	85.1	-0.4	74.1	-0.5	79.6	-0.5	11.0	94.6	58.0	36.6	18.9
	Ratnagiri . . .	110	29.795	+010	29.845	29.988	29.528	.460	.183	78.2	86.6	-0.7	72.7	0	79.7	-0.4	13.9	94.9	59.0	35.9	23.0
	Mormugao . . .	60	29.865	P	29.860	30.047	29.649	.398	.186	77.1	85.6	P	73.7	P	79.7	P	11.9	93.0	64.3	28.7	19.0
MALABAR	Goa . . .	23	29.908	P	29.845	30.097	29.677	.420	.172	77.8	85.1	0	72.6	0	78.9	0	12.5	94.0	60.0	34.0	21.2
	Karwar . . .	44	29.871	-007	29.848	30.059	29.679	.380	.169	76.9	85.2	-0.7	72.5	0	78.9	-0.4	12.7	91.3	59.6	31.7	20.1
	Cochin . . .	10	29.927	-002	29.865	30.047	29.758	.289	.148	78.4	87.2	+0.2	74.6	+0.1	80.9	+0.2	12.6	94.3	68.7	25.6	18.9
	Calicut . . .	27	29.901	-016	29.858	30.035	29.710	.325	.157	78.0	86.2	0	73.6	0	79.9	0	12.6	93.4	64.7	28.7	18.7
	Mangalore . . .	65	29.888	-009	29.860	30.042	29.732	.310	.151	77.5	86.1	-0.4	73.6	-0.4	79.9	-0.4	12.5	92.8	65.0	27.8	18.7
	Trivandrum . . .	198	29.729	P	29.858	29.845	29.574	.271	.149	77.3	83.1	P	74.9	P	79.0	P	8.2	89.0	68.5	20.5	13.5
XI.—South India			...	-004	...	...	...	...	...	88.3	-0.9	71.3	0	9.8	-0.5	17.0	...	...	44.4	26.4	
MADRAS, SOUTH	Pamban . . .	37	29.875	P	29.839	30.051	29.694	.357	.159	81.1	86.6	P	77.1	P	81.9	P	9.5	93.3	68.2	25.1	17.5
	Tinnevely . . .	168	29.751	P	29.848	29.945	29.572	.373	.164	80.9	93.5	P	76.2	P	85.0	P	17.4	105.0	66.4	38.6	26.3
	Madura . . .	447	29.460	-004	29.844	29.643	29.273	.370	.163	79.6	92.8	-1.5	73.5	0	83.2	-0.8	19.4	104.5	62.2	42.3	29.1
MADRAS, SOUTH CENTRAL.	Salem . . .	940	28.996	-007	29.880	29.185	28.799	.386	.162	77.2	91.9	-0.6	70.7	+0.8	81.4	+0.1	21.2	106.5	57.5	49.0	31.2
	Coimbatore . . .	1,348	28.563	-011	29.863	28.731	28.382	.349	.169	74.2	90.1	-0.1	68.6	-1.1	79.4	-0.6	21.4	100.3	59.6	40.7	29.3
	Mercara . . .	3,781	26.225	-004	29.874	26.348	26.060	.288	.135	65.0	74.8*	-1.5*	61.4	+0.7	68.1*	-0.5	13.0	88.5	51.7	36.8	20.3
COORG	Chitaldroog* . . .	2,405	27.509*	P	29.846	27.699	27.296	.403	.172	73.0	84.9	P	66.6	P	75.8	P	18.3	99.2	54.9	44.3	27.8
	Bangalore Bazar . . .	2,982	26.984	-007	29.885	27.145	26.796	.349	.157	69.4	82.9	-0.9	64.0	+0.2	73.5	-0.4	18.9	96.7	52.9	43.8	27.4
	Bangalore Fort . . .	3,019	26.937	-021	29.866	27.097	26.742	.355	.161	69.1	83.4	-0.9	63.9	+0.2	73.7	-0.4	19.5	97.3	52.4	44.9	27.7
MYSORE	Hassan . . .	3,091	26.879	P	29.878	27.019	26.695	.324	.148	70.1	82.4	P	61.4	P	71.9	P	21.0	97.6	47.4	50.2	30.8
	Negapatam . . .	31	29.883	+006*	29.843	30.073	29.689	.384	.165	80.9	89.1	-0.3	75.6	0	82.4	-0.2	13.6	103.2	64.7	38.5	23.8
	Cuddalore . . .	12	29.894	P	29.835	30.100	29.678	.422	.175	80.1	90.0	P	74.2	P	82.1	P	15.9	105.3	61.3	44.0	25.4
MADRAS, EAST-COAST, SOUTH.	Trichinopoly . . .	255	29.657	-007	29.846	29.861	29.470	.391	.165	79.8	94.2	+0.3	74.1	+0.5	84.2	+0.4	20.1	105.7	60.9	44.8	30.1
	Madras . . .	22	29.887	-001	29.840	30.110	29.627	.483	.205	80.5	90.8	+0.2	74.2	-0.5	82.5	-0.1	16.6	107.5	59.5	48.0	26.7

* Mean of 11 months { Chitaldroog wanting for January,
Mercara " " February,
Seoni " " July,
Raichur " " July.

I.—contd.

at 193 Stations in India, Burma, etc., in the year 1893—contd.

WIND DIRECTION.										WIND VELOCITY.			HYGROMETRY, 8 A.M.			RAINFALL.							STATION.	METEOROLOGICAL PROVINCE OR DISTRICT.
Number of winds from										Mean velocity in miles per hour.	Normal.	Percentage variation.	Mean humidity of year.	Mean vapour tension of year.	Mean cloud amount of year.	Number of rainy days during year.	Normal number of rainy days.	Variation.	Rainfall of year.	Normal rainfall of year.	Variation from normal of year.	Heaviest rainfall in 24 hours during year.		
Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.																
40	27	43	26	9	11	26	95	88	6.7	5.6	+20	68	.531	3.2	51	44.36	+6.64	27.74	33.74	-6.00	1.51	Khandwa	CENTRAL PROVINCES WEST.	
70	9	81	51	2	15	72	59	6	3.1	2.9	+7	71	.570	4.2	68	60.53	+7.47	52.10	58.40	-6.30	4.41	Hoshangabad.		
44	88	58	18	11	11	39	44	52	6.2	5.0	+24	66	.576	4.3	82	64.93	+17.07	58.37	51.00	+7.37	3.13	Nagpur.		
92	24	24	26	34	18	42	58	47	3.6	?	?	72	.610	4.2	90	?	?	64.79	?	?	2.74	Chanda	CENTRAL PROVINCES, CENTRAL.	
16	23	112	41	22	6	80	30	34	6.1	3.9	+56	75	.578	2.9	91	73.65	+17.35	57.68	57.35	+0.33	3.96	Seoni.		
101	15	24	5	40	52	36	71	21	2.6	3.1	-16	73	.552	4.0	85	65.62	+19.38	73.55	58.54	+15.01	7.32	Jubbulpore.		
120	13	33	29	27	11	64	52	16	3.8	3.5	+9	68	.515	3.0	74	56.93	+17.07	71.64	44.35	+27.29	4.37	Saugor.		
91	32	41	25	6	11	74	64	19	5.6	5.8	-3	73	.620	5.0	78	65.01	+12.39	53.21	54.13	-0.92	4.50	Raipur	CENTRAL PROVINCES, EAST.	
41	83	23	41	11	40	9	75	42	5.8	6.2	-6	68	.544	3.4	73	52.91	+21.09	63.58	43.57	+20.01	4.27	Sutna.		
...	93	75	22	26	63	49	13	24	5.0	?	?	77	.692	4.4	102	?	?	71.00	66.71	+4.29	3.83	Sambalpur.		
88	14	45	36	21	10	64	57	30	5.1	?	?	60	.524	3.8	51	?	?	28.74	32.26	-3.52	2.17	Aurangabad	HYDERABAD, NORTH.	
40	30	20	31	41	18	35	73	77	8.3	?	?	75	.664	4.7	84	?	?	67.83	37.40	+30.43	5.03	Indur.		
...	36	40	54	20	20	77	66	52	7.4	?	?	76	.622	2.8	87	?	?	72.99	42.04	+30.95	6.45	Bidar.		
88	35	33	34	28	14	23	48	61	10.0	?	?	69	.587	4.7	69	?	?	47.88	29.19	+18.69	5.18	Gulbarga	HYDERABAD, SOUTH.	
11	13	27	38	52	37	59	74	54	8.6	?	?	69	.615	4.7	55	?	?	41.53	21.32†	+17.78	4.91	Raichur.		
112	4	10	20	37	19	9	136	18	5.8	?	?	76	.618	5.2	81	?	?	54.00	33.22	+20.78	2.57	Hyderabad (Deccan).		
53	...	48	53	26	6	36	79	64	7.4	7.1*	+4	73	.601	4.2	75	?	?	56.32	?	?	2.86	Secunderabad.		
163	10	4	4	64	34	23	40	23	6.8	?	?	79	.745	2.9	68	?	?	54.88	?	?	5.85	Khamamett.		
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	93.85	111.02	-12.33	...		X.—West Coast.
...	36	73	85	30	21	32	58	30	11.0	12.1	-9	79	.756	4.3	76	76.63	-0.63	67.24	78.23	-10.99	5.08	Bombay	KONKAN.	
25	30	31	43	70	33	56	24	53	5.6	10.4	-46	74	.725	4.8	96	97.80	-1.80	95.77	110.33	-14.56	3.59	Ratnagiri.		
11	48	28	79	37	17	27	52	53	8.6	?	?	83	.790	3.7	111	?	?	96.38	?	?	6.37	Mormugao.		
86	11	92	56	10	1	44	35	19	4.6	?	?	78	.751	4.3	109	?	?	91.68	104.07	-9.39	5.80	Goa.		
89	43	133	14	1	...	24	46	13	3.0	?	?	84	.747	3.7	108	109.07	-1.07	112.50	128.66	-16.16	4.29	Karwar.		
39	36	166	48	6	8	3	27	32	6.2	?	?	81	.800	4.2	125	132.16	-7.16	92.10	120.81	-28.71	4.50	Cochin	MALABAR.	
68	40	57	92	26	8	9	9	56	12.7	?	?	83	.791	4.8	120	113.90	+6.10	114.19	112.39	+1.80	7.64	Calicut.		
89	37	56	96	23	3	11	25	25	2.6	3.5	-26	83	.787	4.9	125	128.30	-3.30	117.38	125.67	-8.29	5.08	Mangalore.		
25	111	66	60	6	...	1	18	78	6.0	?	?	85	.795	5.0	96	?	?	57.44	?	?	2.79	Trivandrum.		
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	46.89	43.72	+5.42	...		XI.—South India.
10	47	54	50	31	38	78	34	23	8.9	?	?	80	.852	4.3	45	33.10	+11.90	34.43	37.00	-2.57	3.10	Pamban	MADRAS, SOUTH.	
...	83	30	5	9	3	32	64	139	6.8	?	?	69	.724	6.3	46	43.00	+3.00	36.18	28.07	+8.11	3.58	Tinnevely.		
54	106	50	8	13	3	13	12	106	2.1	4.2	-50	73	.742	3.8	62	43.71	+18.29	50.83	30.31	+20.52	4.90	Madura.		
94	28	68	10	10	53	79	19	4	4.3	4.5	-4	74	.700	5.1	72	66.50	+5.50	44.45	43.98	+0.47	3.07	Salem	MADRAS, SOUTH CENTRAL.	
...	66	28	59	7	114	57	32	2	3.6	4.7	-23	85	.725	5.0	49	45.20	+3.80	26.24	21.89	+4.35	3.58	Coimbatore.		
1	48	45	79	9	...	13	76	94	7.6	5.7	+33	86	.536	6.6	144	137.20	+6.80	101.49	131.52	-30.03	3.44	Mercara	COORG.	
15	2	15	47	37	7	85	99	27	8.9	?	?	74	.604	5.4	60	?	?	29.76	?	?	2.48	Chitaldroog.		
...	11	41	63	40	23	86	92	9	7.6	5.4	+41	82	.593	6.3	65	61.68	+3.32	37.65	36.93	+0.72	3.65	Bangalore Bazar.	MYSOER.	
9	2	31	66	49	13	73	111	11	6.7	?	?	82	.594	5.0	64	?	?	36.93	?	?	3.23	Bangalore Fort		
31	10	37	56	54	7	43	72	55	4.2	?	?	81	.596	5.7	56	?	?	28.88	?	?	2.08	Hassan.		
60	13	37	41	10	34	34	97	39	7.0	5.6	+25	74	.783	5.6	59	60.74	-1.74	61.40	58.93	+2.47	6.17	Negapatam	MADRAS, EAST COAST, SOUTH.	
...	59	17	9	6	32	65	79	98	3.5	?	?	85	.880	4.8	55	56.80	-1.80	70.10	53.06	+17.04	5.78	Cuddalore.		
118	25	47	3	2	1	59	81	29	4.5	5.9	-24	71	.717	5.0	54	45.45	+8.55	38.80	33.72	+5.08	6.61	Trichinopoly.		
24	48	23	24	11	54	95	69	17	6.5	7.0	-7	77	.805	5.3	55	60.53	-5.53	43.05	55.79	-12.74	6.30	Madras.		

* Mean of 10 months (wanting for January and February).

† Mean of 11 months (wanting for June).

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Table

Abstract of Observations taken at 8 A.M.

METEOROLOGICAL PROVINCE OR DISTRICT.	STATION.	Elevation of barometer above sea-level in feet.	PRESSURE, 8 A.M., IN INCHES.							TEMPERATURE OF AIR.												
			Mean actual pressure (reduced to 32°) of year.	Variation from normal.	Mean pressure of year reduced to sea-level and to constant gravity 45° Lat.	Highest pressure recorded during year.	Lowest pressure recorded during year.	Absolute range during year.	Mean monthly range of pressure.	Mean of 8 A.M. of year.	Mean maximum of year.	Variation from normal of year.	Mean minimum of year.	Variation from normal of year.	Mean daily temperature of year.	Variation from normal of year.	Mean daily range of temperature.	Highest temperature observed during year.	Lowest temperature observed during year.	Absolute range during year.	Mean monthly absolute range.	
MADRAS, EAST COAST, CENTRAL.	Nellore	71	29.818	?	29.822	30.060	29.537	.523	.201	80.9	93.3	?	75.0	?	84.2	?	18.4	111.3	61.1	50.2	28.0	
	Masulipatam . . .	15	29.874	-.003	29.824	30.146	29.518	.628	.223	79.5	89.0	-1.4	74.0	-0.2	81.5	-0.8	15.1	110.7	61.2	49.5	2.9	
MADRAS, CENTRAL.	Cuddapah	433	29.471	-.025*	29.847	29.705	29.206	.499	.184	80.2	93.6	-0.8	73.8	-0.5	83.7	-0.7	19.8	108.3	58.3	50.0	29.6	
	Kurnool	923	28.972	?	29.843	29.204	28.682	.522	.193	77.0	90.6*	-2.0*	69.9	-0.7	80.4*	-1.5*	20.4*	106.6	51.2	55.4	31.6*	
	Bellary	1,475	28.431	+0.017	29.856	28.637	28.171	.466	.177	76.3	90.7	-2.5	69.8	-0.6	80.2	-1.6	20.9	105.3	54.0	51.3	30.2	
MADRAS, EAST COAST, NORT. H.	Rajahmundry . . .	112	29.762	-.002	29.812	30.040	29.362	.678	.224	78.5	90.7	-1.6	73.7	-0.1	82.2	-0.9	17.0	108.1	58.9	49.2	27.4	
	Cocanada	26	29.852	+0.006†	29.813	30.138	29.405	.733	.243	78.6	87.5	0	73.0*	-0.8*	79.4*	-0.4*	12.9*	107.8	59.5	48.3	23.7*	
	Vizagapatam . . .	31	29.837	0	29.805	30.127	29.397	.730	.254	80.7	83.9	-1.5	78.0	+1.6	80.9	0	5.9	95.9	62.4	33.5	13.0	
	Gopalpur	21	29.839	?	29.800	30.144	29.405	.739	.273	76.1	84.8	?	72.1	?	78.5	?	12.7	96.2	54.0	42.2	22.7	
XII--Hill Stations																						
BALUCHISTAN . . .	Kachh Fort . . .	?	24.010*	?	?	24.200	23.686	.514	.259*	60.4*	?	?	?	?	?	?	96.5	17.0	79.5	?		
	Quetta	5,502	24.602	+0.017	?	24.928	24.327	.601	.264	55.0	72.6	-0.7	42.9	-1.7	57.8	-1.2	29.8	95.6	11.8	83.8	47.5	
	Kalat	?	?	?	?	?	?	?	?	?	?	?	37.8	?	?	?	97.2	3.0	94.2	?		
	Chaman	?	?	?	?	?	?	?	?	65.3	78.4	?	54.0	?	66.2	?	24.4	112.0	27.1	84.9	44.3	
NORTHERN INDIA . . .	Srinagar	5,204	24.865	?	?	25.179	24.527	.652	.336	48.6	64.2	?	42.9	?	53.6	?	21.3	91.3	4.1	87.2	39.3	
	Gilgit	?	25.810	?	?	26.700	25.060	.640	.583	59.6	74.5	?	52.6	?	63.6	?	22.0	113.2	20.6	92.6	42.8	
	Cherat	?	25.667	?	?	25.961	25.345	.616	.316	61.3	72.2	?	56.0	?	64.1	?	16.2	99.5	25.6	73.9	35.7	
	Murree	6,344	23.802	-0.019	?	24.043	23.469	.574	.283	53.2	62.6	-3.4	48.9	-2.1	55.8	-2.7	13.7	85.7	19.2	66.5	30.8	
	Simla	7,224	23.077	-0.018	?	23.285	22.861	.424	.244	51.9	58.5	-4.9	47.9	-2.1	53.2	-2.5	10.6	78.4	19.2	59.2	24.8	
	Chakrata	7,052	23.210	-0.019	?	23.403	22.992	.411	.243	52.9	61.0	-3.1	47.3	-1.6	54.4	-2.4	13.2	80.3	21.1	59.2	27.8	
	Mussooree	?	23.516	?	?	23.741	23.282	.459	.251	53.0	60.4	?	48.9	?	54.7	?	11.5	83.3	24.0	59.3	25.1	
	Ranikhet	5,069	24.073	+0.006	?	24.292	23.818	.474	.226	55.6	64.6	-3.1	51.1	-1.9	57.9	-2.5	13.5	84.5	26.0	58.5	26.7	
	Gnatong	?	19.042†	?	?	19.331	18.799	.532	.209	37.5	43.7	?	25.7	?	34.7	?	18.0	59.4	-5.5	64.9	32.6	
	Darjeeling	7,421	22.966	0	?	23.174	22.724	.450	.245	50.6	56.7	-1.4	46.0	-0.8	51.4	-1.1	10.7	73.6	25.7	41.9	21.3	
CENTRAL INDIA . . .	Mount Abu . . .	3,945	26.006	-0.014	?	26.258	25.726	.532	.253	55.6	72.4	-4.1	60.0	-1.8	66.2	-3.0	12.4	90.2	32.0	58.2	23.7	
	Pachmarhi	3,528	26.434	+0.009	?	26.661	26.095	.566	.225	68.3	77.0	-2.1	60.1	-0.8	68.6	-1.4	16.9	97.2	34.3	62.9	30.1	
SOUTH INDIA . . .	Wellington . . .	6,200	24.255	+0.010	?	24.371	24.108	.263	.133	61.9	70.2	0	52.7	-1.3	61.4	-0.8	17.5	78.7	35.7	43.0	27.2	
	Kodaikanal . . .	?	?	?	?	?	?	?	?	58.7	65.4†	?	51.7	?	58.7†	?	13.4†	74.5	40.1	34.4	22.3†	
XIII--Extra India																						
CEYLON	Colombo	40	29.901	-.003	29.867	30.031	29.757	.274	.150	82.0	85.8	?	74.8	?	80.3	?	11.0	92.0	62.0	30.0	17.8	
PERSIA	Meshed	?	?	?	?	?	?	?	?	56.3†	68.7	?	46.2	?	57.5	?	22.5	98.4	4.0	94.4	45.2	
	Bushire	14	29.855	?	29.825	30.310	29.371	.939	.312	75.0	82.1	?	69.0	?	75.6	?	13.1	108.5	41.8	66.7	29.6	
	Jask†	?	29.804	?	?	30.296	29.183	1.113	.390	80.8	88.4	?	74.6	?	81.5	?	13.7	02.3	53.8	48.5	25.3	
ARABIA	Muscat†	?	29.831	?	?	30.209	29.406	.803	.283	81.2	83.7	?	79.5	?	81.7	?	4.2	98.7	63.5	35.2	14.2	
	Baghdad	?	29.535	?	?	29.904	28.978	.926	.289	68.3	85.5*	?	59.2	?	71.2*	?	28.8*	114.9	30.0	84.9	43.4*	
	Aden	94	29.818	?	29.844	30.073	29.509	.564	.157	81.1	88.4	?	78.0	?	83.2	?	10.3	97.7	67.0	30.7	19.2	
	Perim	?	?	?	?	?	?	?	?	81.6*	?	?	78.1*	?	?	?	?	99.3	70.4	28.9	?	
ARABIAN SEA ISLANDS.	Amini Divi . . .	?	29.913	?	29.856	30.056	29.738	.318	.163	82.2	87.3	?	76.8	?	82.1	?	10.5	96.3	68.5	27.8	18.0	
	Minicoy	10	29.936	?	29.871†	30.056	29.780	.276	.146	80.4	86.0	?	?	?	?	?	?	92.4	73.8	18.6	?	
AFRICA	Zanzibar	73	29.990	?	29.990	30.177	29.799	.378	.137	77.6	82.4	?	75.3	?	78.9	?	7.2	88.5	69.0	19.5	13.3	

* Mean of 10 months	{	Cuddapah	wanting for November and December.
		Kurnool	" February and March.
		Cocanada	" May and June.
		Kachh Fort	" January and November.
		Bagdad	" May and June.
		Perim	wanting information for mean of 8 hours temperature and minimum for June and July and for other elements for July only.
† Mean of 11 months	{	Gnatong	wanting for September.
		Kodalkanal	" February.
		Jask	" January.
		Muscat	"
		Perim.	— See above.

I.—concl'd.

at 193 Stations in India, Burma, etc., in the year 1893—concl'd.

WIND DIRECTION.									WIND VELOCITY.			HYGROMETRY, 8 A.M.		Mean cloud amount of year.	RAINFALL.							STATION.	METEOROLOGICAL PROVINCE OR DISTRICT.
Number of winds from									Mean velocity in miles per hour.	Normal.	Percentage variation.	Mean humidity of year.	Mean vapour tension of year.		Number of rainy days during year.	Normal number of rainy days.	Variation.	Rainfall of year.	Normal rainfall of year.	Variation from normal of year.	Heaviest rainfall in 24 hours during year.		
Calm.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.															
82	11	5	6	46	36	2	78	99	6.8	?	?	78	.813	7.3	47	44.30	+ 2.70	43.12	39.08	+ 4.04	5.04	Nellore . . .	MADRAS, EAST COAST, CENTRAL.
65	62	29	6	32	37	19	47	68	6.4	7.0	- 9	84	.852	5.6	67	55.24	+11.76	54.42	42.19	+12.23	7.90	Masulipatam.	MADRAS, CENTRAL.
...	14	23	49	53	26	79	61	60	?	?	?	69	.701	4.8	61	46.00	+15.00	39.32	33.79	+ 5.53	3.82	Cuddapah . . .	MADRAS, CENTRAL.
269	...	1	6	...	...	5	74	10	?	?	?	70	.650	4.5	54	48.93	+ 5.07	43.05	27.88	+15.17	5.20	Kurnool.	MADRAS, CENTRAL.
82	6	10	28	50	13	48	80	48	6.2	6.5	- 5	76	.695	4.6	46	35.00	+11.00	23.51	18.78	+ 4.73	2.55	Bellary.	MADRAS, EAST COAST, NORTH.
72	96	34	9	2	6	17	80	49	?	?	?	75	.780	5.4	79	50.58	+28.42	49.50	40.14	+ 9.36	5.00	Rajahmundry . . .	MADRAS, EAST COAST, NORTH.
5	123	31	7	11	1	80	53	54	8.4	?	?	79	.776	4.1	73	55.10	+17.90	71.89	41.42	+30.47	8.53	Cosanada.	MADRAS, EAST COAST, NORTH.
2	32	11	2	3	8	37	208	61	1.6	2.9	-45	75	.800	5.3	63	64.38	- 1.38	57.08	47.72	+ 9.36	7.63	Vizagapatam.	MADRAS, EAST COAST, NORTH.
24	92	6	2	3	39	96	11	92	11.9	9.7	+23	85	.778	2.3	68	61.35	+ 6.65	56.32	52.17	+ 4.15	3.75	Gopalpur.	MADRAS, EAST COAST, NORTH.
...
...
...
337	1	...	1	8	7	6	3	2	2.9	4.0	-27	65	.307	1.8	32	22.45	+ 9.55	13.95	8.97	+ 4.98	0.62	Kachh Fort . . .	BALUCHISTAN.
...	...	...	1	1	43	113	1	175	?	?	?	?	?	?	21	?	?	12.08	?	?	0.41	Quetta.	BALUCHISTAN.
79	7	5	32	46	53	104	26	13	7.6	?	?	43	.238	2.5	22	?	?	7.04	?	?	0.42	Chaman.	BALUCHISTAN.
204	24	16	8	48	41	3	6	13	2.3	?	?	87	.345	4.6	50	?	?	24.51	?	?	2.12	Srinagar . . .	NORTHERN INDIA.
...	...	...	...	...	...	...	...	...	?	?	?	?	?	?	12	?	?	5.07	?	?	1.19	Gilgit.	NORTHERN INDIA.
78	84	30	16	36	54	13	10	44	7.4	?	?	57	.336	3.9	51	?	?	35.14	?	?	2.76	Cherat.	NORTHERN INDIA.
55	31	23	25	94	9	9	11	108	8.1	6.8	+20	63	.274	3.9	113	67.56	+45.44	81.39	50.56	+30.83	10.03	Murree.	NORTHERN INDIA.
110	139	15	5	12	77	4	1	2	?	2.0	?	66	.276	4.5	103	84.52	+18.48	58.93	63.91	- 4.98	1.55	Simla.	NORTHERN INDIA.
134	3	42	118	9	2	4	45	7	7.7	?	?	73	.316	3.6	119	?	?	95.66	63.94	+31.72	5.40	Chakrata.	NORTHERN INDIA.
46	22	28	103	45	7	5	38	71	?	?	?	78	.338	4.5	133	79.73	+43.27	123.40	89.00	+33.11	3.27	Mussooree.	NORTHERN INDIA.
253	9	5	42	3	4	4	40	5	2.3	2.2	+ 5	74	.351	4.6	111	77.29	+33.71	85.38	51.04	+34.34	6.36	Ranikhet.	NORTHERN INDIA.
19	17	30	59	93	15	20	52	58	4.4	?	?	80	.197	4.5	193	?	?	150.12	?	?	4.60	Gnatong.	NORTHERN INDIA.
62	15	64	86	31	12	43	36	14	5.3	4.1	+39	87	.344	6.7	130	119.43	+10.57	130.53	122.51	+ 8.02	6.18	Darjeeling.	NORTHERN INDIA.
61	25	61	14	12	6	63	77	46	7.2	7.1	+ 1	62	.390	3.7	74	53.19	+20.81	130.30	60.62	+69.68	15.51	Mount Abu . . .	CENTRAL INDIA.
35	22	21	56	26	17	44	113	31	7.5	5.2	+44	63	.437	4.1	94	80.37	+13.63	74.25	76.23	- 1.98	4.59	Pachmarhi.	CENTRAL INDIA.
202	14	32	7	23	7	46	21	10	2.8	3.3	-15	71	.399	4.6	101	88.63	+12.37	71.53	50.26	+21.27	3.36	Wellington . . .	SOUTH INDIA.
27	27	110	15	57	7	13	13	96	8.5	?	?	71	.347	5.2	131	98.70	+32.30	84.57	60.96	+23.61	2.07	Kodaikanal.	SOUTH INDIA.
...
10	46	50	20	21	31	112	66	9	8.1	?	?	74	.820	4.7	104	?	?	87.63	91.08	-3.45	6.33	Colombo . . .	CEYLON.
187	22	8	26	8	46	14	27	27	?	?	?	?	?	2.7	10	?	?	3.49	?	?	0.87	Mesher . . .	PERSIA.
...	39	83	42	88	6	13	2	92	6.5	?	?	66	.599	?	22	?	?	16.93	13.33	+3.60	5.30	Bushire.	PERSIA.
6	51	26	52	71	34	18	19	44	?	?	?	69	.755	1.2	6	?	?	2.65	?	?	0.90	Jask†.	PERSIA.
...	12	35	89	29	20	17	65	67	?	?	?	72	.784	1.1	4	?	?	2.05	?	?	0.78	Muscatt . . .	ARABIA.
44	140	53	25	23	15	8	11	45	?	?	?	51	.358	?	15	?	?	6.05	?	?	0.75	Baghdad . . .	ARABIA.
67	4	56	153	16	28	23	6	6	12.2	11.7	+5	74	.792	3.7	1	?	?	1.47	1.97	-0.50	1.30	Aden.	ARABIA.
4	23	39	112	75	17	4	23	38	17.4	?	?	73	.784	2.8	4	?	?	2.58	?	?	1.61	Perim,†	ARABIA.
29	56	26	4	1	1	52	113	83	?	?	?	77	.854	5.7	72	?	?	66.65	?	?	3.35	Amni Divi . . .	ARABIAN SEA ISLANDS.
19	43	55	24	17	5	5	87	110	11.7	?	?	80	.825	5.0	96	?	?	62.72	?	?	4.76	Minicoy.	ARABIAN SEA ISLANDS.
...	23	59	22	42	108	86	2	4	8.1	?	?	83	.786	5.8	99	?	?	71.44	?	?	4.36	Zanzibar	AFRICA.

† Mean of 11 months (Gilgit wanting for July).

Abstract of Observations recorded at 10 A.M. and 4 P.M.

METEOROLOGICAL PROVINCS.	STATION.	Elevation of bar-cistern above sea-level in feet.	PRESSURE.						TEMPERATURE OF AIR.										
			Mean of 10 hours.	Mean of 16 hours.	Mean daily range.	Mean daily pressure.	Variation from normal.	Mean reduced to S. L. and to gravity 45° Lat.	Mean maximum.	Mean minimum.	Mean daily range.	Highest maximum.	Lowest minimum.	Absolute range.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.	
BURMA COAST AND BAY ISLANDS.	Port Blair . . .	...	29°850	29°754	°096	29°799	-°011	29°790	86°3	76°8	9°5	93°8	68°8	25°0	83°0	83°7	80°4	+0°1
	Rangoon . . .	...	29°880	29°764	°116	29°825	-°008	29°803	88°3	71°8	16°5	101°9	56°2	45°7	80°5	84°3	78°0	-0°8
	Diamond Island . . .	...	29°884	29°781	°103	29°830	-°008	29°806	83°7	75°1	8°6	90°0	66°3	23°7	80°7	81°3	78°3	-0°6
	Cocos Island . . .	111							Imperfect.										
	Akyab . . .	...	29°891	29°785	°106	29°838	+°001	29°801	85°2	70°6	14°5	93°6	49°1	44°5	80°1	82°0	77°2	-1°3
ASSAM . . .	Silchar . . .	...	29°802	29°680	°122	29°743	+°003	29°799	84°7	67°0	17°7	101°8	42°9	58°9	77°1	81°9	74°8	-0°7
	Sibsagar . . .	...	29°596	29°467	°129	29°531	+°011	29°824	80°2	65°3	14°9	98°6	40°9	57°7	73°3	78°8	71°6	-0°7
	Dhubri . . .	...	29°779	29°650	°130	29°730	+°022	29°784	80°7	?	?	96°5	46°0	50°5	73°8	79°4	?	?
	Chittagong . . .	...	29°817	29°715	°101	29°766	+°007	29°802	83°5	68°6	14°8	92°7	46°3	46°4	78°5	80°4	75°4	-0°9
BENGAL AND ORISSA . . .	Dacca . . .	...	29°862	29°749	°112	29°806	+°008	29°775	84°4	69°5	14°9	96°3	46°1	50°2	78°5	81°4	70°5	-1°3
	Calcutta (Alipore). . .	...	29°849	29°741	°108	29°792	+°007	29°759	83°9	69°7	14°2	96°9	45°9	51°0	78°8	81°7	76°4	-1°4
	Do. (Chowringhee) . . .	?	29°854	?	?	?	?	?	85°5	69°8	15°7	98°2	47°0	51°2	80°3	?	77°7	?	
	Saugor Island . . .	...	29°844	29°738	°106	29°791	+°008	29°758	83°6	72°2	11°4	97°1	48°2	48°9	79°9	81°2	76°8	-1°5
	Burdwan . . .	...	?	?	?	?	?	?	85°4	69°9	15°5	105°9	45°1	60°8	78°4	83°0	76°7	-2°3
	Berhampore . . .	...	29°809	29°694	°115	29°748	+°017	29°764	84°2	69°4	14°8	105°2	43°1	62°1	77°6	81°9	75°9	-2°3
	False Point . . .	...	29°852	29°748	°104	29°801	-°006	29°763	84°2	71°5	12°7	94°5	48°0	46°5	81°4	81°5	76°7	-1°0
	Cuttack . . .	...	29°784	29°668	°116	29°729	-°005	29°752	88°1	72°0	16°1	105°1	51°4	53°7	82°4	85°9	78°8	-1°4
	Hazariabagh . . .	...	27°842	27°750	°092	27°796	+°003	29°745	81°5	63°4	18°1	102°2	40°2	62°0	75°3	78°2	71°4	-2°4
	Patna . . .	...	29°679	29°563	°116	29°619	+°003	29°756	84°8	67°8	17°0	108°4	40°7	67°7	79°3	82°5	75°3	-2°1
GANGETIC PLAIN AND CHOTA NAGPUR.	Darbhanga . . .	...	29°711	29°591	°121	29°650	+°016	29°772	83°8	68°0	15°8	103°5	44°6	58°9	76°9	82°3	75°2	-1°4
	Allahabad . . .	...	29°544	29°431	°113	29°483	+°002	29°751	87°3	66°3	21°0	111°0	39°8	71°2	79°7	83°5	76°0	-1°4
	Ghazipur . . .	220	?	?	?	?	?	?	86°5	67°5	19°0	109°3	42°5	66°8	79°5	83°9	76°0	-0°7	
	Lucknow . . .	...	29°484	29°374	°110	29°426	0	29°754	85°8	64°6	21°2	111°3	40°0	71°3	79°0	83°0	74°9	-2°1
	Dehra Dun . . .	...	27°619	27°540	°079	27°570	-°003	29°770	77°8	59°6	18°2	100°4	34°4	66°0	70°5	73°9	67°5	-3°1
UPPER SUB-HIMALAYAS	Dehra Dun (Forest School.) . . .	?	27°631	27°548	°083	27°590	?	?	78°9	58°3	20°6	?	?	?	71°8	75°1	67°9	?	
	Roorkee . . .	...	28°950	28°850	°110	28°893	+°008	29°751	83°5	61°9	21°6	108°7	35°8	72°9	74°5	80°9	71°8	-2°1
	Meerut . . .	...	29°109	29°009	°099	29°052	+°013	29°759	84°3	62°5	21°8	110°2	36°0	74°2	76°1	82°0	72°7	-2°1
	Lahore . . .	...	29°128	29°043	°085	29°079	+°004	29°761	85°6	62°1	23°6	112°3	33°0	79°3	76°9	83°4	72°8	-0°4
	Ludhiana . . .	...	29°016	28°926	°089	28°964	+°001	29°748	84°1	62°9	21°2	110°4	37°4	73°0	76°3	82°1	72°6	-1°4
INDUS VALLEY AND N.-W. RAJPUTANA.	Peshawar . . .	...	28°745	28°651	°094	28°691	-°001	29°830	83°5	58°6	24°9	112°0	31°9	80°1	73°8	81°1	70°0	-0°6
	Mooltan . . .	...	29°410	29°321	°090	29°358	+°003	29°747	90°4	65°6	24°8	114°5	37°6	76°9	78°5	88°9	77°1	+0°8
	Jacobabad . . .	...	29°653	29°533	°120	29°586	+°004	29°729	94°4	65°1	29°3	118°9	34°4	81°5	83°7	92°0	78°6	-0°1
	Kurrachee . . .	...	29°819	29°735	°084	29°776	-°008	29°777	85°8	69°2	16°6	107°7	45°1	62°6	80°7	82°9	76°5	-0°7
	Jeypore . . .	...	28°437	28°338	°099	28°383	+°007	29°782	87°5	63°9	23°7	111°8	36°5	75°3	79°5	84°8	74°5	-1°6
E. RAJPUTANA, CENTRAL INDIA AND GUJARAT.	Ajmere . . .	...	28°268	28°169	°099	28°215	+°004	29°783	85°4	64°1	21°3	107°9	36°1	71°8	77°1	83°8	74°1	-0°7
	Deesa . . .	...	29°401	29°291	°110	29°342	-°006	29°760	91°0	66°2	24°8	111°5	40°0	71°5	82°2	89°1	78°2	-1°8
	Nowgong . . .	...	29°091	28°986	°106	29°035	-°002	29°747	86°6	64°0	22°7	110°1	36°1	74°0	78°9	83°9	74°5	-2°5
	Agra . . .	...	29°319	29°207	°112	29°255	+°018	29°769	87°4	66°6	20°8	114°4	39°3	75°1	79°5	85°2	76°5	-1°3
	Belgaum . . .	...	27°387	27°285	°103	27°336	-°008	29°759	82°5	63°3	19°2	99°0	51°8	47°2	76°3	78°8	71°5	-1°1
DECCAN . . .																			

II.

at 87 Stations in India, Burma, etc., in the year 1893.

TEMPERATURE, WET-BULB.				VAPOUR TENSION.					HUMIDITY.					CLOUD.				Total rainfall for the year.	STATION.	METEOROLOGICAL PROVINCE.
Mean minimum.	Mean 10 hours.	Mean 16 hours.	Mean daily.	From minimum.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.	From minimum.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.			
73.7	78.1	78.1	76.5	.794	.888	.876	.853	-.033	86	79	76	80	-2	6.5	6.6	6.6	+1.3	...	Port Blair .	BURMA COAST AND BAY ISLANDS.
69.6	74.5	74.6	72.9	.709	.782	.736	.742	-.042	89	75	65	76	-3	4.7	5.1	4.9	-.05	...	Rangoon.	
71.9	74.8	74.9	73.9	.749	.793	.784	.775	-.037	85	75	73	78	-2	5.8	6.4	6.1	+1.3	...	Diamond Island.	
					Imper fect.													70.16	Cocos Island.	
68.1	74.8	75.8	72.9	.677	.810	.821	.769	-.002	87	77	74	80	+1	4.8	4.7	4.7	+0.1	...	Akyab.	ASSAM.
66.8	71.9	73.1	70.2	.652	.737	.716	.702	-.009	94	77	65	78	-1	6.3	6.4	6.4	+1.1	...	Silchar .	
64.4	70.2	72.3	69.0	.634	.728	.738	.700	-.002	96	86	72	85	+1	5.4	4.9	5.2	-1.5	...	Sibsagar.	
65.8	69.8	71.7	69.1	?	.700	.701	?	?	?	81	68	?	?	5.2	4.4	4.8	+0.9	...	Dhubri.	
?	72.8	73.6	?	?	.754	.762	?	?	?	74	71	?	?	5.4	5.1	5.3	+0.8	...	Chittagong .	BENGAL AND ORISSA.
67.4	72.8	73.2	71.1	.676	.754	.729	.719	-.036	89	75	67	77	0	5.7	5.6	5.7	+1.2	...	Dacca.	
68.1	72.4	72.6	71.0	.700	.736	.705	.714	-.041	92	72	64	76	-2	4.9	5.4	5.2	+0.8	...	Calcutta (Alipore).	
68.8	77.3	?	?	.722	.780	?	?	?	95	73	?	?	?	?	?	?	?	88.75	Do. (Chowringhee).	
68.9	74.9	74.8	73.2	.729	.820	.800	.783	-.042	88	78	73	80	0	6.4	6.3	6.3	+1.6	...	Saugor Island.	GANGES PLAIN AND CHOTA NAGPUR.
68.0	71.1	71.9	70.4	.694	.695	.661	.684	-.008	90	68	57	72	+3	5.1	5.5	5.3	+0.9	...	Burdwan.	
66.9	72.3	72.8	70.7	.664	.751	.706	.707	+0.15	87	76	64	76	+2	5.2	5.4	5.3	+0.4	...	Berhampore.	
70.3	75.1	74.8	73.4	.751	.803	.789	.781	-.014	94	73	72	80	-1	5.7	5.7	5.7	+1.0	...	False Point.	
69.8	73.0	73.5	72.1	.722	.706	.676	.701	-.022	89	62	54	69	-1	4.1	5.1	4.6	+0.5	...	Cuttack.	GANGES PLAIN AND CHOTA NAGPUR.
59.4	65.4	66.2	63.8	.489	.539	.517	.514	+0.032	78	60	54	64	+7	5.5	6.1	5.8	+1.2	...	Hazaribagh .	
64.9	70.3	70.6	68.6	.619	.651	.618	.629	+0.004	85	64	56	68	+3	4.4	4.1	4.2	+0.1	...	Patna.	
66.2	70.8	71.6	69.5	.666	.693	.658	.670	-.002	91	71	59	73	+2	3.6	3.3	3.5	+0.6	...	Darbhanga.	
62.6	69.2	69.8	67.2	.563	.608	.553	.575	+0.001	81	59	55	65	+4	4.3	4.4	4.4	+1.2	...	Allahabad.	UPPER SUB-HIMALAYAS.
64.3	70.2	70.8	68.4	.606	.645	.608	.620	+0.058	84	63	53	66	+10	4.0	3.9	3.9	+1.0	44.42	Ghaziपुर	
62.4	68.6	69.4	66.8	.578	.595	.565	.580	+0.033	88	59	50	66	+9	4.2	4.3	4.2	+0.7	...	Lucknow.	
56.7	62.9	64.3	61.3	.458	.509	.516	.494	?	83	66	60	69	?	4.2	5.2	4.7	+0.8	...	Dehra Dun .	
55.8	63.6	65.2	61.5	.463	.516	.527	.502	?	85	64	58	69	?	?	?	?	?	110.19	Dehra Dun (Forest School), Roorkhee.	INDUS VALLEY AND N.W. RAJPUTANA.
59.3	66.1	67.5	64.3	.515	.567	.529	.537	+0.047	86	65	50	67	+9	3.9	4.0	4.0	+1.0	...	Meerut.	
60.6	65.5	66.9	64.3	.553	.525	.490	.523	+0.010	91	56	46	64	+6	3.6	3.4	3.5	+0.5	...	Lahore.	
58.4	66.0	67.7	64.0	.495	.536	.508	.513	+0.028	81	56	44	60	+9	2.9	3.1	3.0	+0.4	...	Ludhiana.	
60.3	66.3	67.5	64.8	.542	.555	.526	.541	+0.040	87	60	47	65	+7	4.0	4.5	4.3	+0.9	...	Peshawar .	EAST RAJPUTANA, CENTRAL INDIA AND GUJARAT.
53.9	62.2	64.2	60.1	.409	.465	.433	.436	+0.010	74	53	40	56	+3	2.7	4.0	3.4	+0.3	...	Mooltan .	
60.1	67.3	71.5	66.2	.503	.565	.590	.553	+0.019	73	53	41	55	+1	1.7	2.3	2.0	+0.3	...	Jacobabad.	
59.2	67.2	69.2	65.2	.465	.508	.448	.474	+0.012	68	42	29	46	+2	1.5	1.8	1.7	-.02	...	Kurrachee.	
65.4	72.6	74.2	70.7	.619	.721	.753	.698	+0.035	80	67	65	71	+4	3.1	3.9	4.3	+0.9	...	Jeyapore .	EAST RAJPUTANA, CENTRAL INDIA AND GUJARAT.
58.1	66.0	67.3	63.8	.449	.501	.477	.476	+0.012	70	49	40	53	+3	2.9	3.4	3.1	+0.3	...	Ajmere.	
60.2	65.5	68.4	64.7	.516	.516	.527	.520	+0.041	81	55	46	61	+10	3.7	4.3	4.0	+0.6	...	Deesa.	
61.1	67.8	68.8	69.9	.512	.514	.455	.494	+0.009	73	46	35	51	+6	4.0	5.0	4.5	+0.4	...	Nowgong.	
?	67.4	68.4	?	?	.554	.514	?	?	?	56	45	?	?	4.0	5.0	4.5	+0.8	...	Agra.	DECCAN.
60.8	67.3	68.8	65.6	.501	.541	.511	.517	+0.015	71	53	43	56	+5	3.5	3.6	3.5	+0.3	...	Belgaum .	
61.1	65.8	66.9	64.6	.520	.513	.520	.517	-.006	88	59	56	67	+4	4.6	5.3	5.0	+0.3	...		

Table

Abstract of Observations recorded at 10 A.M. and 4 P.M. at 87

METEOROLOGICAL PROVINCE.	STATION.	Elevation of barometer above sea-level in feet.	PRESSURE.						TEMPERATURE OF AIR.									
			Mean of 10 hours.	Mean of 16 hours.	Mean daily range.	Mean daily pressure.	Variation from normal.	Mean reduced to S.L. and to gravity 45° Lat.	Mean maximum.	Mean minimum.	Mean daily range.	Highest maximum.	Lowest minimum.	Absolute range.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.
DECCAN—contd.	Sholapur . . .	...	28.312	28.178	.134	28.248	-.001	29.760	90.4	67.0	23.4	106.7	50.6	56.1	81.2	88.1	77.7	-1.3
	Poona . . .	...	28.064	27.952	.112	28.011	-.002	29.773	88.3	63.8	24.5	104.4	46.5	57.9	79.6	84.3	75.8	0
	Akola . . .	...	28.949	28.809	.140	28.876	-.005	29.750	89.3	66.4	23.4	108.6	40.2	68.4	81.2	87.9	77.7	-1.4
	Buldana . . .	2,132	27.755	27.648	.107	27.699	-.005	29.749	85.1	66.1	19.0	103.6	46.7	56.9	77.8	82.6	75.1	-1.9
	Khandwa . . .	...	28.825	28.700	.126	28.760	-.004	29.752	89.3	65.9	23.4	107.2	39.2	68.0	79.5	87.1	76.8	-1.2
	Hoshangabad . . .	...	28.846	28.724	.122	28.782	-.017	29.755	86.8	66.1	20.7	107.9	43.8	64.1	78.6	85.4	75.9	-2.2
	Nagpur . . .	...	28.837	28.709	.128	28.770	+.004	29.742	88.6	68.1	20.5	110.1	46.5	63.6	80.8	85.8	77.8	-1.7
	Jubbulpore . . .	...	28.529	28.415	.114	28.469	+.007	29.747	85.3	64.0	21.3	107.8	37.0	70.8	77.6	83.0	73.8	-1.7
	Saugor . . .	...	28.098	27.992	.106	28.042	+.007	29.742	85.6	64.0	21.5	107.4	39.0	68.4	78.5	83.5	74.1	-1.7
	Raipur . . .	...	28.896	28.769	.127	28.830	+.007	29.735	87.9	66.7	21.1	109.8	41.4	68.4	80.2	85.1	76.7	-2.1
	Sutna . . .	...	28.799	28.689	.109	28.741	-.005	29.738	85.1	64.8	20.3	108.2	37.1	71.1	79.1	83.2	74.1	-1.9
	Secunderabad . . .	...	28.110	28.002	.109	28.058	+.007	29.769	87.9	67.7	20.2	106.1	50.5	55.6	79.3	84.7	76.7	-1.6
	Hyderabad (Deccan) . . .	...	28.208	28.089	.119	28.149	?	29.766	87.1	68.3	18.8	104.2	50.3	53.9	79.7	84.5	77.0	?
WEST COAST . . .	Bombay . . .	...	29.880	29.771	.109	29.821	-.002	29.798	85.3	74.1	11.2	94.6	61.1	33.5	80.2	82.0	78.9	-0.6
	Ratnagiri . . .	...	29.804	29.706	.098	29.751	+.004	29.798	86.6	72.7	13.9	95.2	60.9	34.3	83.2	82.9	78.7	-0.5
	Karwar . . .	...	29.883	29.788	.095	29.832	0	29.807	85.2	72.5	12.8	91.5	59.8	31.7	80.4	82.5	78.1	-0.5
	Cochin . . .	...	29.935	29.834	.102	29.880	-.005	29.818	87.3	74.6	12.6	94.3	68.6	25.7	82.8	84.4	80.2	-0.1
SOUTH INDIA . . .	Salem . . .	...	28.998	28.856	.143	28.936	-.017	29.801	91.9	70.7	21.2	106.5	57.7	48.8	82.9	88.5	79.5	0
	Mercara . . .	...	26.239	26.147	.098	26.201	-.007	29.831	74.7	61.4	13.4	88.7	51.7	37.0	69.0	71.2	67.2	-0.5
	Bangalore . . .	...	26.947	26.834	.118	26.896	?	29.776	83.4	63.9	19.5	97.4	52.6	44.8	75.3	80.4	72.9	?
	Hassan . . .	...	26.884	26.781	.104	26.838	?	29.792	82.3	61.3	21.0	97.6	47.4	50.2	75.3	78.1	70.8	?
	Chitaldroog . . .	...	27.521	27.407	.114	27.466	?	29.770	84.9	66.1	18.7	99.4	54.9	44.5	77.5	82.4	74.9	?
	Trichinopoly . . .	...	29.662	29.521	.141	29.600	-.011	29.783	94.2	74.1	20.0	105.8	60.9	44.9	85.6	91.1	82.4	+0.4
	Madras . . .	...	29.890	29.781	.115	29.840	-.002	29.791	90.8	74.2	16.6	107.6	59.3	48.3	85.5	85.9	81.3	-0.5
	Bellary . . .	...	28.437	28.303	.133	28.372	+.006	29.770	90.2	69.8	21.1	105.2	54.0	51.2	82.3	87.9	79.2	-1.4
	Vizagapatam . . .	...	25.851	25.740	.118	25.793	-.003	29.755	83.9	78.1	5.9	96.2	62.5	33.7	82.8	84.0	81.0	-0.5
	Quetta . . .	...	24.626	24.551	.076	24.581	+.002	?	72.7	43.3	29.2	95.6	12.0	83.6	64.5	70.2	57.4	-0.8
HILL STATION, BALUCHISTAN. HILL STATIONS, NORTH-ERN INDIA.	Leh . . .	11,503	19.683	19.593	.090	19.644	-.018	?	55.7	29.9	25.8	86.7	-4.8	91.5	44.8	50.8	41.9	+0.8
	Srinagar . . .	...	24.880	24.787	.093	24.827	?	?	64.1	42.9	21.2	90.8	0.4	90.4	52.8	62.9	53.2	?
	Murree . . .	...	23.827	23.795	.031	23.803	-.020	?	62.5	48.9	13.6	85.7	19.3	66.4	57.2	58.5	54.7	-2.2
	Chamba . . .	3,005	26.880	26.800	.081	26.847	-.010	?	74.6	55.2	19.5	98.2	30.3	67.9	64.9	70.4	62.8	-2.5
	Kailang . . .	10,087	20.772	20.712	.060	20.749	-.012	?	54.8	31.0	23.8	83.0	-9.8	92.8	45.6	49.7	40.7	-0.3
	Simla (Chapslee) . . .	?	?	?	?	?	?	?	62.5	48.1	14.5	85.2	21.2	64.0	56.4	?	?	?
	Simla (Ridge) . . .	...	23.097	23.050	.046	23.066	-.015	?	58.5	47.9	10.5	78.4	19.2	59.2	54.3	55.4	52.4	-3.3
	Chakrata . . .	...	23.234	23.181	.053	23.200	-.026	?	60.9	47.8	13.1	80.5	21.3	59.2	56.3	56.7	53.2	-2.7
	Ranikhet . . .	...	24.091	24.033	.058	24.050	-.002	?	64.6	51.1	13.4	84.5	26.0	58.5	60.5	61.6	57.1	-2.8
	Katmandu . . .	4,388	25.617	25.527	.090	25.571	-.002	?	73.8	53.9	19.7	94.8	30.2	64.6	64.9	69.1	62.6	-2.5
HILL STATIONS, CENTRAL INDIA.	Darjeeling . . .	...	22.981	22.911	.071	22.945	+.001	?	56.7	45.9	10.7	73.4	25.7	47.7	53.0	54.1	50.7	-1.1
	Demagri . . .	?	?	?	?	?	?	?	83.8	66.6	17.3	94.4	40.5	53.9	77.4	80.1	74.3	-0.5
	Tura . . .	3,943	?	?	?	?	?	?	79.4	67.1	12.3	93.2	45.2	48.0	73.9	76.6	72.6	?
	Mount Abu . . .	...	26.032	25.960	.072	25.992	-.024	?	72.4	60.0	12.4	89.4	32.0	57.4	68.6	70.4	65.7	-2.7
	Pachmarhi . . .	...	26.443	26.355	.088	26.396	-.011	?	76.9	60.1	16.9	97.2	34.1	63.1	71.4	74.2	68.0	?
	Chikaldia . . .	3,642	26.321	26.221	.090	26.273	-.012	?	76.5	62.6	13.9	94.3	41.9	52.4	70.5	74.3	69.2	-2.0

II.—contd.

Stations in India, Burma, etc., in the year 1893—contd.

TEMPERATURE, WET-BULB.				VAPOUR TENSION.					HUMIDITY.					CLOUD.				Total rainfall for the year.	STATION.	METEOROLOGICAL PROVINCE.
Mean minimum.	Mean 10 hours.	Mean 16 hours.	Mean daily.	From minimum.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.	From minimum.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.			
62.1	67.9	69.1	66.4	.516	.525	.482	.508	+0.020	76	50	39	55	+5	4.4	5.7	5.0	+0.1	...	Sholapur . .	DECCAN—contd.
60.3	66.2	67.0	64.6	.526	.488	.456	.482	−0.007	79	51	45	58	+5	4.1	4.8	4.4	−0.2	...	Poona.	
62.4	69.0	70.4	67.4	.537	.564	.481	.541	+0.056	81	54	42	59	+8	4.1	4.9	4.6	+0.9	...	Akola.	
60.3	65.8	66.4	64.2	.469	.498	.460	.476	+0.001	72	53	44	57	+4	3.3	3.9	3.6	−0.5	38.54	Buldana.	
60.5	67.4	69.2	65.7	.492	.536	.502	.510	+0.010	74	54	42	56	+3	3.4	4.0	3.7	+0.3	...	Khandwa.	
61.6	68.4	70.3	66.7	.523	.592	.571	.562	+0.040	77	60	49	62	+6	4.0	4.7	4.4	+0.8	...	Hoshangabad.	
62.6	69.1	70.2	67.3	.525	.583	.559	.555	+0.036	74	57	48	60	+7	4.2	5.3	4.8	+0.3	...	Nagpur.	
61.0	66.9	68.2	65.4	.534	.549	.523	.535	+0.033	86	59	49	64	+7	3.8	4.6	4.2	+0.2	...	Jubbulpore.	
59.5	66.2	67.6	64.4	.484	.515	.498	.499	?	77	54	46	59	?	3.2	3.9	3.6	?	...	Saugor.	
60.6	69.8	70.7	67.0	.495	.607	.573	.558	+0.011	67	60	50	59	+2	4.9	5.8	5.3	+1.3	...	Rajpur.	
60.4	67.0	67.4	64.9	.511	.539	.497	.516	+0.059	78	54	46	59	+9	3.2	3.8	3.5	+0.3	...	Sutna.	
66.0	69.2	71.1	69.0	.614	.598	.599	.603	+0.063	88	61	52	67	+9	4.0	5.1	4.6	+0.9	...	Secunderabad.	
65.1	69.6	70.6	68.4	.592	.608	.585	.594	?	85	61	52	66	?	4.8	5.2	4.9	?	...	Hyderabad (Deccan).	
69.7	73.7	74.7	72.7	.681	.746	.767	.731	−0.048	80	72	70	74	−3	3.8	3.8	3.8	−0.5	...	Bombay . .	WEST COAST.
68.8	74.2	75.4	72.8	.667	.735	.785	.729	−0.010	81	65	70	72	0	4.2	4.9	4.5	+1.5	...	Ratnagiri.	
69.6	73.7	75.0	72.8	.697	.748	.773	.739	−0.024	87	72	70	76	−2	3.5	4.0	3.8	0	...	Karwar.	
72.7	76.1	76.9	75.2	.784	.811	.826	.807	−0.007	92	72	70	78	−2	3.0	4.1	3.6	−1.1	...	Cochin.	
68.2	72.6	72.8	71.2	.663	.667	.601	.643	−0.049	88	59	47	65	−3	5.3	6.7	6.0	+1.6	...	Salem . .	SOUTH INDIA.
59.6	63.9	65.1	62.9	.494	.539	.553	.528	−0.008	90	77	74	80	0	6.4	6.9	6.7	+0.2	...	Mercara.	
61.9	67.1	67.4	65.5	.538	.573	.524	.545	?	90	66	53	70	?	4.6	4.6	4.6	?	...	Bangalore.	
?	67.7	68.3	?	?	.592	.581	?	?	?	68	62	?	?	5.6	6.4	6.0	?	...	Hassan.	
62.0	67.9	68.4	66.1	.482	.532	.492	.502	?	80	61	49	63	?	4.9	5.4	5.1	?	...	Chitaldroog.	
70.2	73.9	74.3	72.8	.691	.688	.625	.668	−0.029	82	57	44	61	−3	4.8	5.4	5.1	−0.7	...	Trichinopoly.	
?	76.5	76.9	75.8	?	.795	.807	.822	+0.049	?	66	66	77	+4	5.4	5.2	5.3	+0.4	...	Madras.	
66.5	73.7	75.7	72.0	.623	.736	.751	.703	−0.039	84	66	57	69	+16	5.0	5.4	5.2	+0.3	...	Bellary.	
70.4	75.9	76.6	74.3	.646	.817	.831	.765	−0.004	61	72	70	68	0	4.7	4.6	4.7	+0.8	...	Vizagapatam.	
40.7	52.6	55.1	49.5	?	?	?	?	?	?	?	?	?	?	1.5	2.4	1.9	−0.3	...	Quetta . .	HILL STATION, BALUCHISTAN.
25.7	35.0	38.1	32.9	.124	.143	.144	.137	+0.005	70	48	41	53	+4	5.0	6.0	5.5	+0.1	6.01	Leh . .	HILL STATIONS, NORTHERN INDIA.
42.0	48.8	54.8	48.5	.301	.351	.389	.347	?	93	77	62	77	?	4.2	4.5	4.4	?	...	Srinagar.	
43.4	49.5	50.9	49.9	.251	.305	.331	.296	+0.015	67	61	63	64	+8	4.4	5.2	4.8	+0.1	...	Murree.	
52.0	57.0	60.0	56.4	.392	.418	.440	.415	+0.017	81	62	56	66	+7	4.7	6.0	5.4	+0.6	61.28	Chamba.	
28.9	37.8	39.1	35.3	.168	.196	.178	.181	−0.001	83	55	47	61	−1	4.8	5.7	5.3	−0.3	22.18	Kailang.	
43.4	49.2	?	?	.258	.302	?	?	?	71	63	?	?	?	5.2	?	?	?	63.77	Simla (Chapslee).	
43.2	47.9	49.5	46.9	.253	.294	.320	.289	−0.007	70	64	69	67	+7	5.3	6.5	5.9	+0.9	...	Simla (Ridge).	
44.9	50.4	51.4	48.9	.293	.333	.352	.326	+0.031	81	77	72	77	+13	3.8	4.9	4.4	−0.3	...	Chakrata.	
48.7	53.5	54.7	52.3	.343	.368	.382	.363	+0.022	85	67	66	73	+9	5.1	6.1	5.6	+1.2	...	Ranikhet.	
52.3	59.1	60.9	57.4	.410	.465	.468	.449	+0.004	89	72	63	75	+4	5.5	6.3	5.9	+1.4	69.21	Katmandu.	
44.7	50.5	51.3	48.9	.300	.368	.369	.344	−0.008	89	84	83	85	+1	7.3	7.7	7.5	+1.0	...	Darjeeling.	
?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	?	155.91	Demagri.	
?	67.9	69.1	?	?	.637	.647	?	?	?	73	69	?	?	4.7	4.6	4.7	+0.2	138.52	Tura.	
53.8	58.7	60.2	57.6	.364	.402	.424	.397	+0.039	68	57	56	60	+9	3.6	4.0	3.8	0	...	Mount Abu .	HILL STATIONS, CENTRAL INDIA.
55.5	61.2	62.3	59.6	.411	.438	.438	.429	?	76	58	54	63	?	4.2	4.7	4.5	?	...	Pachmarhi.	
57.4	62.0	63.3	60.9	.428	.468	.467	.454	+0.020	74	64	58	65	+6	4.9	5.4	5.2	+1.0	75.97	Chikalda.	

Table

Abstract of Observations recorded at 10 A.M. and 4 P.M. at 87

METEOROLOGICAL PROVINCE.	STATION.	Elevation of barometer above sea level in feet.	PRESSURE.						TEMPERATURE OF AIR.									
			Mean of 10 hours.	Mean of 16 hours.	Mean daily range.	Mean daily pressure.	Variation from normal.	Mean reduced to S. L. and to gravity 45° Lat.	Mean maximum.	Mean minimum.	Mean daily range.	Highest maximum.	Lowest minimum.	Absolute range.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.
HILL STATION, SOUTH INDIA. EXTRA INDIA	Wellington . . .	...	24.262	24.188	.074	24.225	+0.001		70.2	52.6	17.6	78.6	35.9	42.7	65.6	65.3	60.2	-0.9
	Aden . . .	...	29.825	29.700	.125	29.759	-0.023	29.78	88.1	78.0	10.1	97.7	67.0	30.7	83.5	86.1	82.6	+0.6
	Perim . . .	...	P	P	?							imperfect.						
	Minicoy . . .	...	29.953	29.861	.094	29.904	P	29.839	85.7	P	P	92.4	P	P	82.6	83.0	P	P
	Zanzibar . . .	...	P	P		Imperfect.			82.5	75.4	7.1	85.3	71.3	14.0	?	81.7	78.7	P

II.—concl'd.

Stations in India, Burma, etc., in the year 1893—concl'd.

TEMPERATURE, WET-BULB.				VAPOUR TENSION.					HUMIDITY.					CLOUD.				Total rainfall for the year.	STATION.	METEOROLOGICAL PROVINCE.
Mean minimum.	Mean 10 hours.	Mean 16 hours.	Mean daily.	From minimum.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.	From minimum.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.	Mean 10 hours.	Mean 16 hours.	Mean daily.	Variation from normal.			
50·9	58·2	59·0	56·0	·361	·414	·439	·404	+·014	89	66	71	75	+3	5·1	6·3	5·7	0	...	Wellington	HILL STATION, SOUTH INDIA, EXTRA INDIA.
71·5	75·5	74·9	73·9	·690	·785	·720	·731	-·017	72	68	58	66	-2	2·9	0·9	1·9	-0·7	...	Aden	
73·9	76·6	76·8	75·8	P	·839	·836	?	?	P	75	74	?	?	1·5	0·8	1·2	P	...	Perim.	
72·5	P	74·1	P	76·5	?	P	?	?	87	P	?	?	P	5·0	5·4	5·2	P	...	Minicoy.	
														P	4·3	P	P	...	Zanzibar.	

G. I. C. P. O. No. 1 Meteor.—6-8-94.—400.

GOVERNMENT OF INDIA.
METEOROLOGICAL DEPARTMENT.

MONTHLY WEATHER REVIEW, JANUARY 1893.

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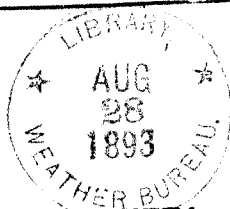
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BY

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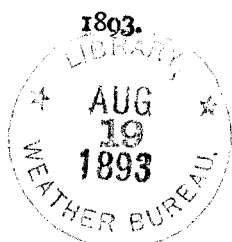
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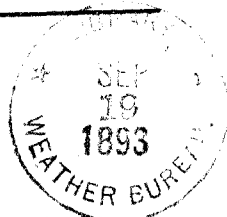
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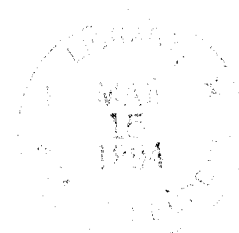
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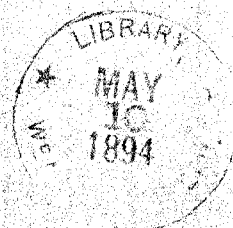
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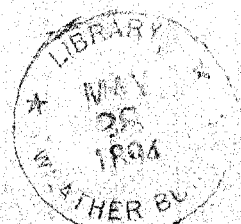
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